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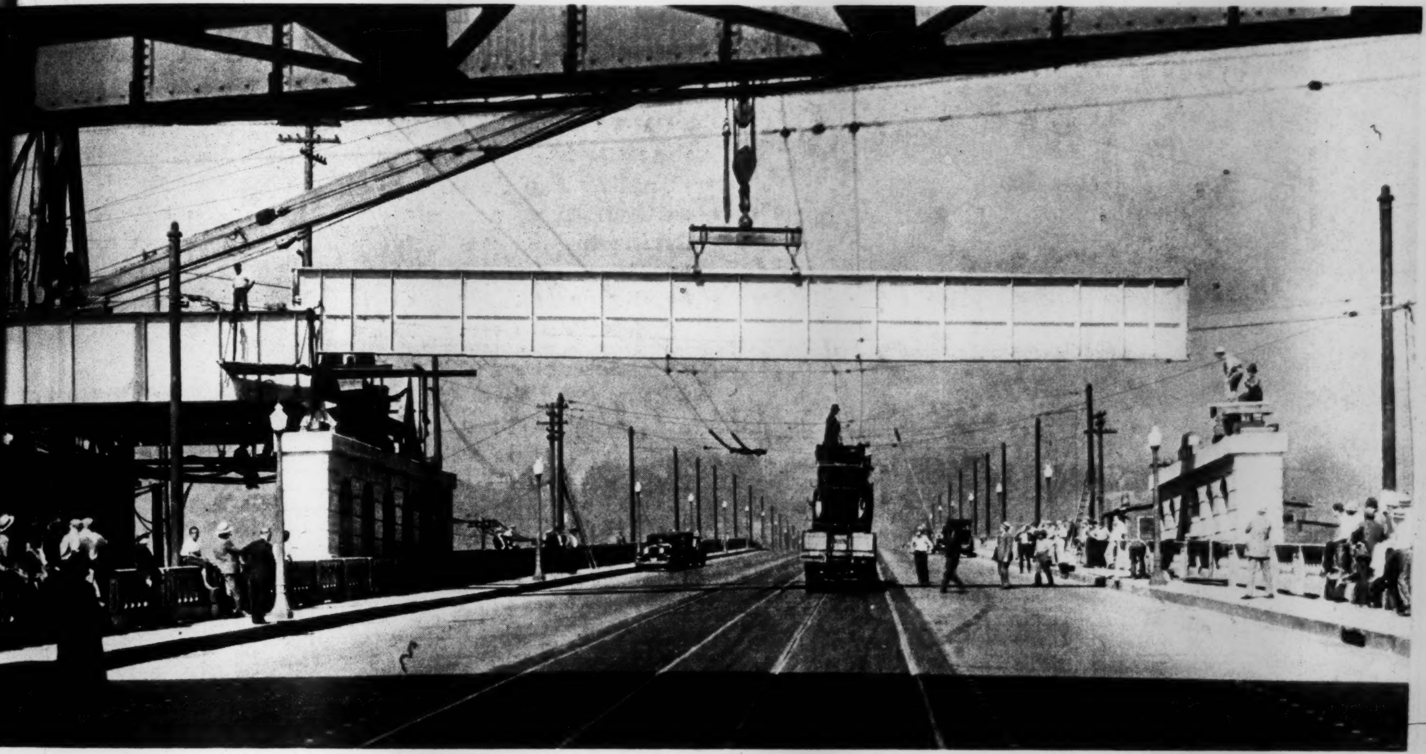

Track elevation steel,
Cincinnati Union Terminal project

Cincinnati New Union Terminal

Hydraulic Fill Combined with Dumped Fill for High Embankment

An Analysis of Railroad Abandonments

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Cellular Corewalls for Embankment Dams

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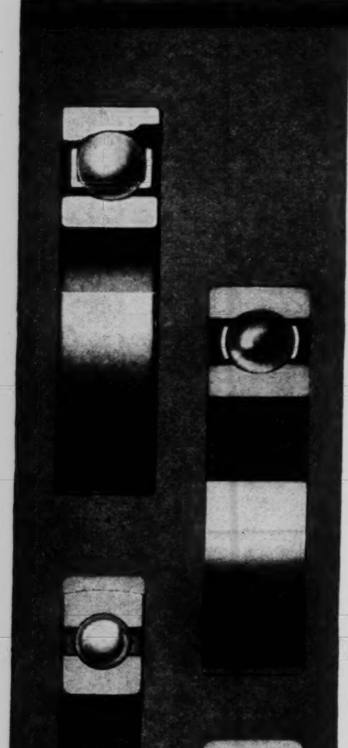

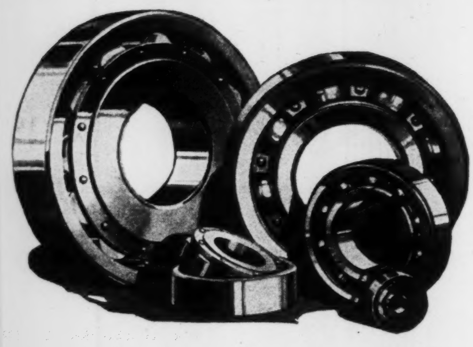

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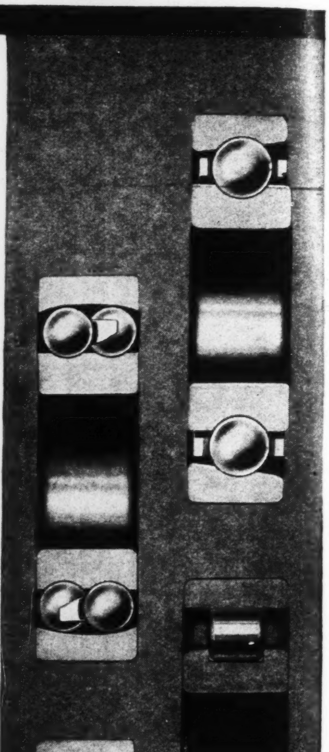

BEARINGS

ENGINEERING NEWS-RECORD

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DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. Schmitt, *Editor*

Volume 106 NEW YORK, FEBRUARY 26, 1931 Number 9

Niagara Conservation

REJECTION by the Senate committee on foreign relations of the proposed treaty with Canada for remedial works above Niagara Falls is a desirable development. Not that the works are not needed, for they are, but because the treaty went about getting them in the wrong way. The treaty proposed that the Niagara Falls Power Company and the Hydro-Electric Power Commission of Ontario, jointly, build weirs and do other work above the falls to redistribute the flow, and that in return they be permitted to divert additional amounts of water from above the falls over a short period of years. That plan had the supposed advantage of not requiring any cash outlay on the part of the two governments. But it would, at least on the part of the United States government, have put the government under obligation to a private corporation to see that it was repaid for its expenditures regardless of how effective the remedial works turned out to be in making the additional diversions of water possible. A new start should be made. The two governments should do the work themselves or else pay the power companies for doing it. Then, after the effect of the remedial works has been studied, normal permits to use such of the water as can be drawn off in addition to what is now in use can be entered into.

Nothing Settled

NONE of the open questions which entangle the Mississippi River flood-control work was settled by the Congress just coming to an end. A bill was introduced to have the federal government assume the cost of paying for levee rights-of-way, and presumably also floodway and other land costs, but the prospects are that this bill with many others will die in committee. Therefore the verification of the serious doubts and controversies surrounding the project is deferred at least for the better part of a year. This is due primarily to the inability of the army engineers to complete their report on review of the official plan. This plan has proved to be objectionable. Court decisions a year ago overturned one of its vital assumptions in declaring that floodway construction could not disregard the property rights of the residents of the floodway area. By these decisions many of the economic data on which the project rested were upset. Reservoir storage possibilities, which had had only superficial examination before the official plan was drafted but have since been investigated in two years of elaborate studies, affect so many considerations of public policy that they should have patient and thorough consideration by Congress before action is taken. Such consideration must wait until the December session. The delay, even though inevitable, is to be regretted. It leaves the flood-control project surrounded by uncertainty and thereby makes it impossible for the regions directly affected to settle down and plan their own development on the basis of definite knowledge of what is to be done.

A Natural Development

OVER four hundred railroads and railroad branch lines having a total length of 6,400 miles have been abandoned and torn up in the past ten years. By many this development has been viewed with concern, the general impression being that it was a sign of decadence, possibly the result of competition from motor vehicles. But a careful analysis of what has taken place, such as is published elsewhere in this issue, reveals no such gloomy picture. In the first place 6,400 miles is, after all, a very small fraction of the mileage of the whole railway system of the country. Further, only a small part of all the miles abandoned is chargeable to motor competition. Most of it is due to the depletion of natural resources; to worked-out mines and denuded hills. Other lines are those which never should have been built. They were laid out by overoptimistic promoters to serve regions unready or unsuited for development. Still others have been made obsolete by newer lines with better grades. What has taken place is not abnormal or unnatural; it is but the cutting off of dying branches to aid and strengthen the growing tree.

Concurrent Originality

A STUDY of architectural and engineering history will reveal that the new ideas that presaged important developments were invariably germinating in a number of minds simultaneously. It is almost impossible to name a single person as the sole originator of an important contribution, without fear of successful contradiction. These thoughts are engendered by news of the death last week of L. S. Buffington, the Minneapolis architect who was believed by many to have originated the idea of skeleton frame buildings. It is certain that Buffington was one of the most prolific dreamers and persistent exponents of the idea and that he even secured a patent for it in 1888. But W. L. B. Jenney already had built the Home Insurance Building in Chicago in 1884-85, and such other well-known architects and engineers as Daniel Burnham, John Root, William Holabird, J. M. Ewen and Corydon T. Purdy were thinking in terms of curtain instead of masonry walls in the early '80s. It is altogether possible that each of these men and perhaps others of the same period as well as some of their predecessors conceived the idea of a skeleton frame quite independent of outside suggestions or help. Another more recent instance of concurrent originality involves the multiple-span suspension bridge. Both D. B.

Steinman, of New York, and the late Louis R. Ash, of Kansas City, applied for patents on such a structure only to find that at least one had been built in France as early as 1835. Now word comes that a structure made up of eight 320-ft. spans is actually under construction over the South Canadian Railway in Texas. Its designer, Wilder Kenan, of San Antotnio, states he thought the idea original. The natural conclusion is that engineering developments are not so much a matter of invention as of design. And since capable designers are plentiful, the same revolutionary plan may be presented in Shanghai and St. Louis on the same day and by men who have never heard of each other. Fortunately, the honor is always great enough to stand division.

Business to the Attack

ENGINEERS have wondered for years at the inscrutable psychology of the army engineers who imposed arbitrary, variable and previously unspecified conditions on bridges over navigable waters. They have never understood clearly—or even unclearly—why a clearance height of 135 ft. was approved on the Delaware, 190-odd was demanded on the Columbia, 150 on the Kill van Kull, and 180 to 200 or more on the Hudson, since all these are first-class water-ways. But the inquiring attitude of the civil engineering profession failed to bring explanation or clearness, or bring about consistent decision. Now business is moving to the attack. A recent review by *The Business Week* of the irregular practice in fixing bridge heights is evidence that the commercial importance of the matter is coming to be perceived. The elevation of bridges does in decidedly effective manner lay a burden on commerce, communication and business that becomes more important as time goes on. When business wakes to a full realization of this burden, it is likely to make its voice heard in the halls of Congress loudly enough to obtain a remedy of the ill.

Station Track Plans

A DEPARTURE from the conventional track layout in large passenger stations is to be introduced in the new Cincinnati union station, now under construction. This consists in a triple-track arrangement at each end of the station, in place of the usual pairs of tracks alternating with the platforms. In a through station many trains require changes in make-up which involve switching movements; dining and parlor cars may have to be detached, or sleeping cars and through cars from some other route coupled in. As a rule such switching movements include the throat tracks of the station approach, thus interfering more or less with train movements through the throat. By the new arrangement cars can be switched to or from the train track and a third track between the platform tracks without using the throat tracks. And this is accomplished while still retaining a compact and convenient layout of tracks and platforms. In a station of the dead-end or headhouse type, where all trains terminate their runs, such an arrangement would rarely be useful. Yet a different arrangement, three tracks between the platforms, has been used in some large European dead-end stations and in the terminal station at Sydney, Australia, but this plan is generally in connection with suburban service, for changing the engine from one end of the train to the other or to enable the engine of an inbound train to be cut off and run out of the station without waiting for the train to be released. For such purpose the middle tracks, though little used, must extend the full length of the platform. The Cincinnati plan differs essentially from this one; it is a new and suggestive idea.

Wanted, a Simple Rate Base

THE whole question of railway valuation is once again thrown open by the attempt on the part of the Interstate Commerce Commission to collect so-called excess earnings from the Norfolk & Western Railway. The commission has picked upon a large and prosperous railroad, which with its subsidiaries has property worth several hundred millions of dollars in use in transportation service of the country. If that property in 1926 had a value of $379,000,000, as the commission claims, then the net income exceeded 6 per cent of value and one half of the excess is payable to the government under the 1920 law; but if in the same year the property was worth $742,000,000, as the railroad claims, then the net income does not exceed 6 per cent and none of it is recapturable by the government. Thus the whole matter hinges on the old, old question of what is the value of a railroad or any other public utility property, and whether there is more than one kind of value; for example, whether "value for rate-making purposes" differs from "going concern values" or "taxable value."

In the now famous St. Louis & O'Fallon Railway case the U. S. Supreme Court threw out the commission's valuation on the ground that the commission had not taken into consideration the "cost of reproduction new." The court did not say how much consideration should be given to reproduction cost, but indicated that it might vary from nothing to a controlling factor in fixing value.

In the present Norfolk & Western case the commission states that it has given consideration to the cost of reproduction new and to the cost of reproduction less depreciation. The latter figure for 1926 checks closely with the "value" used in the commission's recapture computation. Thus the supreme court's requirement appears to have been met, and the legal advisers of the railroad companies may have to concentrate their attack upon its findings on some other point.

Nothing shows more clearly the need for some simple and equitable way of fixing a rate base than do these endless litigations. Millions of dollars have been spent upon them which could have purchased new engines and built better track. The same is true of other utilities; every time rates need to be changed the whole complicated structure of the utility's property must be gone over piece by piece and an argument entered into as to what it is worth. Years ago, when property could be reproduced for less than its original cost, those who were trying to keep utility property values at the lowest possible figure hit upon the idea that the property should be valued on the basis of what it would cost to reproduce it at the time of valuation. Subsequently, as costs began to rise again, and as they continued to rise, the utility men applied the reproduction-cost theory to their advantage. Now that commodity and construction costs are down 20 per cent the tables may turn again. On the reproduction-new basis some $160,000,000 of the $800,000,000 spent by the railroads on construction and equipment in 1929 could be wiped off the books. There is food for thought here for those who are so certain that reproduction-cost-new is the ideal base for determining value.

There is no easy road to the establishment of a simple rate base value. In so far as the railroads are concerned, the Interstate Commerce Commission has recommended to Congress that rates be based not upon property value in a strict sense but upon a rate base computed upon the now completed valuation of railroad properties as of 1914 plus subsequent investment, less an allowance for depreciation.

Upon Congress and the supreme court rests the primary responsibility for clearing up the present situation, but great responsibility rests upon the railroads and other utilities themselves. Unless they will acknowledge that their property is not vested with all the rights of private property, and, starting from that point, will cooperate in setting up a simple and equitable rate base formula, almost anything that Congress can provide may be nullified by them in the courts so long as the supreme court continues to interpret law in the light of the dicta of earlier courts rather than in the light of present-day conditions.

An Official View of Competition

IT IS a well-rooted popular belief that where government activities come into competition with private activities the competition should be on even terms. Such a principle is increasingly important in these times, when there is frequent occasion and necessity for the government to undertake business activity, temporarily or permanently. Such operations manifestly should rest on correct cost accounting, and where competitive charges or rates are involved should fix these in such a way as to cover cost. But a statement contained in an official bulletin of the post office department under date of Dec. 11 reflects a different view. The bulletin tells of proposed increases in parcel-post rates, made necessary by the fact that the parcel-post service lost more than fifteen million dollars last year. After telling of the proposed increases, the bulletin continues as follows:

> "These proposed increases and adjustments in the parcel post scales," Mr. Tilton says [F. A. Tilton, assistant postmaster general], "do not bring the rates fully up to the computed cost of handling and transporting parcel post, but they are approximately 5 per cent higher, as a whole, than the present scales, and probably approach the limit of what the traffic will bear." The proposed schedules of parcel-post rates are considerably below the average express rates, although in the case of heavy parcels destined to points near the inner boundary of zones instances may still be found where the express rates are lower than the parcel-post rates.

Thus the government says three things that in conjunction reflect a curious philosophy of government business operations: that the proposed rates will not cover the cost of the service; that they are well below the rates of competing private services; and, despite the two preceding facts, that they approach the limit of what the traffic will bear. A service that has been so widespread a convenience to the people as the parcel-post service merits being founded on a better philosophy. The same thing applies, obviously, to such operations as Muscle Shoals and Boulder Canyon. Only a sound and square business method can make such enterprises constructive elements in our industrial life.

Brick Paving Problems

ASSOCIATION activity in developing brick paving has taken on a changed aspect with the increased participation of paving engineers in the proceedings of the National Association of Paving Brick Manufacturers. This organization, the only body definitely concerned with advancing brick paving, has had important work to do. But it has always been under a handicap because of the implied charge that its technical conclusions were influenced by commercial interest. Now that engineers have been drafted into the association management and convention proceedings, this charge no longer survives. Today no more clearly cut technical treatment of paving problems can be found anywhere than was presented at the association's recent Pittsburgh meeting—which, incidentally, was the silver anniversary of the organization.

It is particularly important that engineering and research thinking should be centered on brick paving. Despite its long use, brick pavement presents about as many undetermined problems as does any form of hard surfacing employed by the highway engineer. These problems relate to base construction, bedding materials and joint fillers, all of which are still concededly unsatisfactory. About the only settled fact is that paving brick are adequate in quality and variety. In practical terms this means that the manufacturer's product is superior to the engineer's skill in converting it into pavement structure.

Base-course cracking has not been controlled, and it does injury to the brick surfacing. Bedding sand shifts and is lost through the base cracks. Joint fillers cause trouble by incomplete penetration, surface bleeding and other faults. Such shortcomings of practical pavement construction are serious handicaps to the development of brick paving.

The encouraging fact is that these faults in construction are being sought out and that effective efforts are in progress to correct them. The score and a half papers and discussions at the conference mentioned gave very definite evidence of progress. Concrete base construction is being studied with attention to better concrete design, improved mixes, covered joint construction to control cracking, and truer surface profiles. Unstable bedding courses are being improved by cementitious admixtures to the bedding sand or by the substitution of self-cementing bedding materials, such as granulated slag.

Most uncertainty continues to surround joint-filler practice. The trouble is with the material as well as with its application. Repressed brick without lugs, used extensively, leave scant opportunity for gravity flow of even very fluid fillers to the full joint depth. Squeegee application is indirect, and even with the best of care leaves a slickening film on the brick surface. Wider joints, or perhaps positive pressure application of joint filler, are possible remedies. Bleeding is a further complicating problem.

Particular interest resides in these facts because it is beginning to be realized that brick paving problems can be attacked by survey and analysis. Research has until recently been directed largely to the brick itself, and it has produced an exceptionally strong and durable product. Now that study is being directed to pavement structure and construction rather than to the brick, developments are in sight that will strengthen the position of an old-established pavement type.

Union Station and Terminal for Cincinnati

Novel track layout to facilitate switching on platform tracks—Seven railroads will use the station—Freight yards and engine terminal included—Site formed by 5,000,000-cu.yd. fill

DISTINCTIVE FEATURES in the design of the new Cincinnati Union Station and terminal (now under construction) include: (1) a novel track layout for an internal switching arrangement at the platform tracks, which will enable set-out and pick-up movements to be made without fouling the throats of the station approaches; (2) complete separation of freight and passenger train movements within the terminal area, which movements under the present arrangement cause much interference and delay; (3) separation of outgoing and incoming passengers at the station building, with corresponding separation of taxicab, streetcar and other local transport facilities; (4) construction of extensive freight yards for roads that at present have inadequate yards on the terminal site; (5) provision of coal and locomotive servicing facilities; (6) a loop for turning trains; (7) extensive park development in front of the station by the city in order to provide a spacious and attractive environment.

This new passenger station and terminal, which will be used by all the seven trunk lines entering the city, is estimated to cost $41,000,000. This amount covers all work and real estate within the limits of the terminal company, while about 10 per cent of this is for changes in streets, bridges and utilities for the benefit of the city. Including the new tracks, diversions, approaches, freight yards, engine terminals and other improvements on the individual roads as auxiliary to the new terminal, the total cost will amount to some $120,000,000. The time set for the completion of the passenger terminal is Oct. 1, 1933. To insure steady and systematic progress on the great amount and variety of work involved, detailed construction schedules or coordinated programs have been prepared and are supplemented by progress charts.

Present Stations—For the seven railroads at Cincinnati there are now two main stations; two railroads divide their traffic and use both stations. Thus the Central Union Station, which was built in 1884 and handles the bulk of the traffic, serves six roads, while the Pennsylvania Railroad Station serves three roads. The former Baymiller St. terminal station was abandoned when the Baltimore & Ohio acquired the Cincinnati, Hamilton & Dayton a few years ago. There are also two local stations used by certain trains; the Fourth St. station of the Chesapeake & Ohio and the Court St. station of the Pennsylvania. All these stations are of the stub or terminal type, so that through trains have to back out of the stations to resume their journeys.

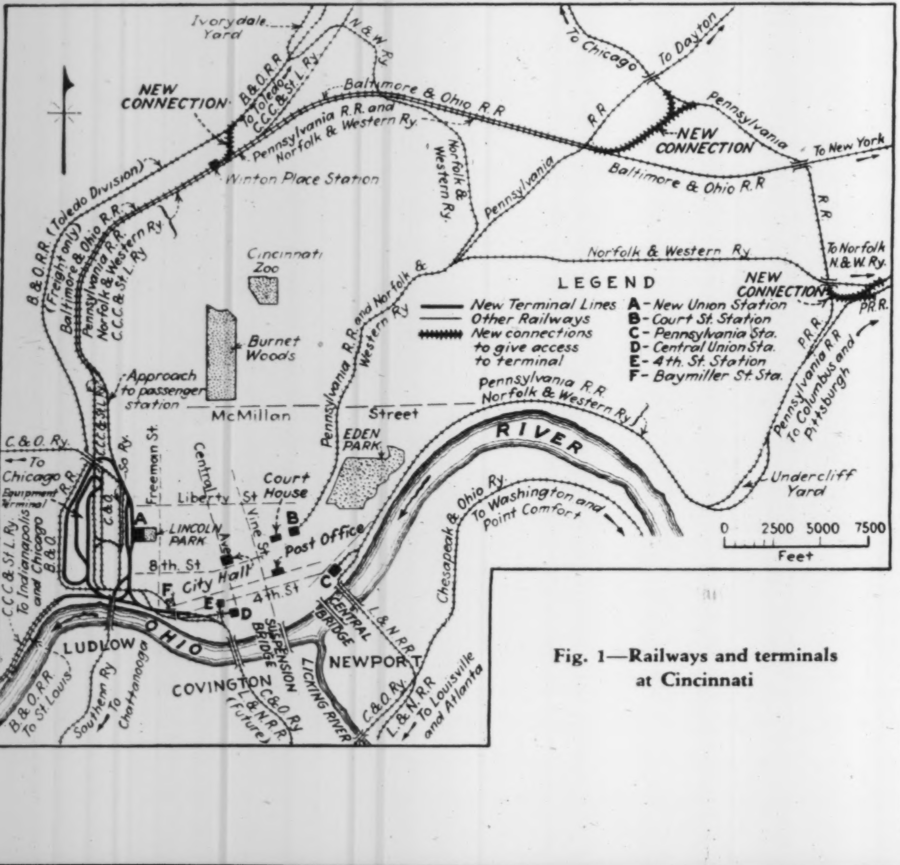

Ivorydale Yard
N.&W. Ry.
NEW CONNECTION
B.&O.R.R. To Toledo
C.C.C.& St. L. Ry.
Baltimore & Ohio R.R.
Pennsylvania R.R. and Norfolk & Western Ry.
Winton Place Station
B.&O.R.R. (Toledo Division) (Freight only)
Baltimore & Ohio R.R.
Pennsylvania R.R.
Norfolk & Western Ry.
C.C.C.& St. L. Ry.
Norfolk & Western Ry.
Cincinnati Zoo
Burnet Woods
Approach to passenger station
McMillan Street
Pennsylvania R.R. and Norfolk & Western Ry.
EDEN PARK
To Chicago
To Dayton
R.R.
Pennsylvania
NEW CONNECTION
To New York
Baltimore & Ohio R.R.
R.R.
Pennsylvania
Norfolk & Western Ry.
To Norfolk N.& W. Ry.
NEW CONNECTION
P.R.R.
LEGEND
New Terminal Lines
Other Railways
New connections to give access to terminal
A - New Union Station
B - Court St. Station
C - Pennsylvania Sta.
D - Central Union Sta.
E - 4th. St. Station
F - Baymiller St. Sta.
Pennsylvania R.R. Norfolk & Western Ry.
P.R.R.
Pennsylvania R.R. To Columbus and Pittsburgh
RIVER
Undercliff Yard
Chesapeak & Ohio Ry. To Washington and Point Comfort
0 2500 5000 7500
Feet
C.&O. Ry. To Chicago
Equipment Terminal
R.R.
C.C.C.& St. L. Ry.
So. Ry.
C.&O.
Freeman St.
Liberty St
Court House
Central Ave.
Vine St.
LINCOLN PARK
Post Office
8th. St
City Hall
4th. St
A
B
C
D
E
F
C.C.C.& St. L. Ry. To Indianapolis and Chicago
B.&O.
OHIO
LUDLOW
CENTRAL BRIDGE
SUSPENSION BRIDGE
L.& N. R.R.
NEWPORT
COVINGTON
B.&O.R.R. To St. Louis
Southern Ry To Chattanooga
L.& N.R.R. (Future)
C.&O. Ry.
LICKING RIVER
C.&O. Ry.
L.& N. R.R. To Louisville and Atlanta

Fig. 1—Railways and terminals at Cincinnati

As the present Central Union Station is at the west end, near the business center and in a congested industrial district, while the Pennsylvania Station is at the east end, a considerable rearrangement of facilities and some new construction is necessary to bring all the roads into the new Union Station, which will be ¾ mile west of the present union station. Thus the Louisville & Nashville, on the south side of the river, will abandon its present line and its Ohio River bridge, giving access to the Pennsylvania station, and will come in over the new double-track bridge of the Chesapeake & Ohio. The Pennsylvania Railroad will build a diversion line around the north end of the city to connect with the Baltimore & Ohio and come in over that road. This line will be used also by the Norfolk & Western. These present and future arrangements are shown in Fig. 1.

With present ordinary and maximum daily traffic of 70 to 90 trains inbound and the same numbers outbound, the capacity of the old union station, handling by far the greater proportion of the traffic, has long been out-

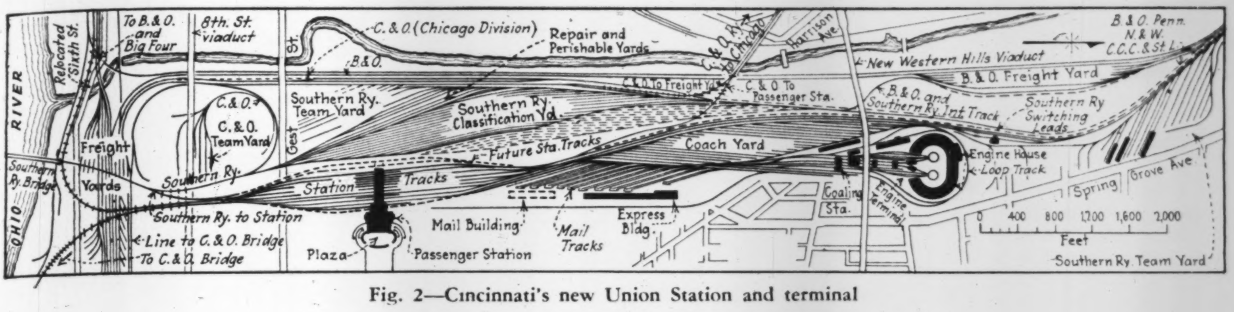

Relocated Sixth St.
RIVER
OHIO
Southern Ry. Bridge
To B.&O. and Big Four
8th. St. viaduct
Freight
Yards
C.&O.
C.&O. Team Yard
Southern Ry.
Southern Ry. to Station
Line to C.&O. Bridge
To C.&O. Bridge
St.
Gest
C.&O. (Chicago Division)
B.&O.
Repair and Perishable Yards
Southern Ry. Team Yard
Southern Ry. Classification Yd.
Future Sta. Tracks
Station
Tracks
Plaza
Passenger Station
Mail Building
Mail Tracks
Express Bldg.
C.&O. Ry. to Chicago
Harrison Ave.
C.&O. To Freight Yd.
C.&O. To Passenger Sta.
New Western Hills Viaduct
B.&O. Freight Yard
B.&O. and Southern Ry. Int. Track
Southern Ry Switching Leads
Coach Yard
Coaling Sta.
Engine Terminal
Engine House
Loop Track
Spring Grove Ave.
B.&O. Penn. N.&W. C.C.C.&St.L.
0 400 800 1,200 1,600 2,000
Feet
Southern Ry. Team Yard

Fig. 2—Cincinnati's new Union Station and terminal

grown. With its limited train capacity, its two approach tracks, its complicated connections with various railroads and its intermingling of passenger and freight traffic on the approaches, trains reaching the city on time may be an hour or more late when they finally enter the station. At times of very high floods in the Ohio River both main stations are under water, and trains have to stop and start in the yards on higher ground outside the business district.

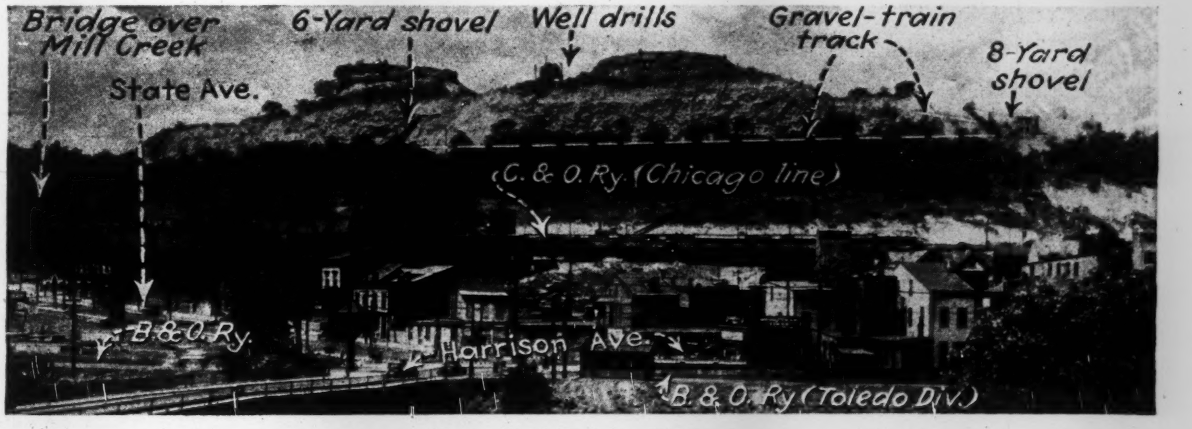
Projects for New Terminals—In 1917 the trustees of the Cincinnati Southern Railway (now leased by the Southern Railway) proposed a municipally owned union station, to be built by a bond issue, the railway having been built in this way after the Civil War in order to develop trade and communication with the South. However, this project did not come to public vote. Of various private projects the most important was that of John E. Bleekman, who, about 1910, proposed a new union station at Third and Pearl Sts., three blocks east of the old (and present) Central Union Station and about a block north, so as to be on higher ground above flood level.

In July, 1927, after a period of negotiations, all the railroads entered into an agreement to use a new union station and they combined in the organization of the present Cincinnati Union Terminal Co. A site of about 300 acres was selected on the east side of Mill Creek, with a length of 2½ miles and a width of 1,200 ft. This site is for both passenger and freight facilities and the station will be about 1 mile from the center of the business district, or ¾ and 2 miles from the present main stations. Definite plans were approved by the company and the city in July, 1929, and work began in August.

General Layout—A special feature of the adopted plan, Fig. 2, was the construction of freight yards by the terminal company for the Chesapeake & Ohio Railway and the Southern Railway, whose old yards were included in the new site or were rendered inaccessible by the new approaches. Passenger trains from the north and east will enter at the north end over a four-track approach, passing around the engine terminal and coach yard. This route includes the Baltimore & Ohio, the Pennsylvania, the Norfolk & Western and the Big Four (Cleveland, Cincinnati, Chicago & St. Louis). The Chesapeake & Ohio line from Chicago has its own entrance, coming down a steep grade from the west side of Mill Creek, which it crosses on a high-level bridge. From the bridge one viaduct will cross the new freight yards and descend to the station approach, while another viaduct will lead down into the freight yard.

Trains from the south and west will enter the south end of the station. From its Ohio River bridge the Cincinnati, New Orleans & Texas Pacific (leased to the Southern Railway) has a direct lead by a viaduct to the station approach. An elevated connection to this approach has one leg turning west to serve the parallel main lines of the Baltimore & Ohio and the Cleveland, Cincinnati, Chicago & St. Louis along the river, while the other leg turns east to connect with the viaduct approach to the new Chesapeake & Ohio bridge, which will be used also by the Louisville & Nashville.

Of these seven roads only the Baltimore & Ohio and the Big Four operate through trains, all others starting and terminating at Cincinnati. Although the Chesapeake & Ohio has lines running both north and south they are


Bridge over Mill Creek
State Ave.
6-Yard shovel
Well drills
Gravel-train track
8-Yard shovel
C.&O. Ry. (Chicago line)
B.&O. Ry.
Harrison Ave.
B.&O. Ry (Toledo Div.)

Razing Bald Knob at Cincinnati

This high round hill is being cut down to supply 5,000,000 cu.yd. of filling for the new Union Station site, beyond left side of view. It will be graded to about the level of the Chesapeake & Ohio Railway (Indiana division). The loaded dump-car trains come down a spiral track to this line and pass over the Mill Creek Bridge. Indicated on the view are the two big excavators and some of the well drills putting down blast holes.

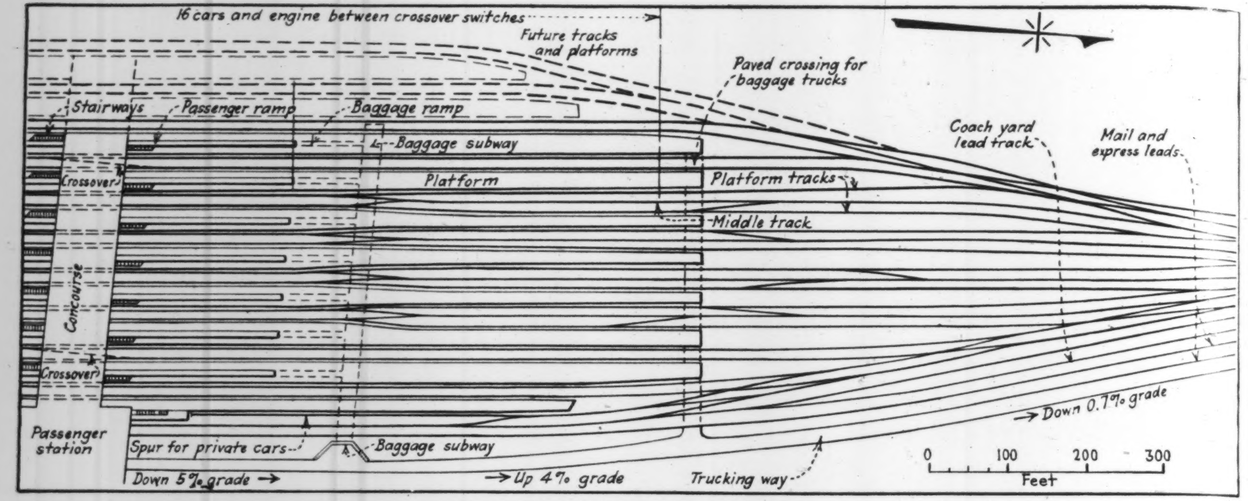


Fig. 3—Novel layout of station tracks

operated independently. However, through cars are run on numerous routes, necessitating transfer from one train to another at Cincinnati.

North of the station is to be a group of parallel stub tracks for express and mail. Here the terminal company will erect a large building for the express agencies, and the U. S. Postoffice Department is planning a railway mail building to cost $3,000,000. Beyond are the coach yard and engine terminal, which the terminal company will operate to serve all the railroads except the Southern Railway, as this road has extensive new facilities at Ludlow, just south of the river. Thus, Southern Railway trains having discharged passengers will pull out north, pass around the loop and return by a thoroughfare track to the Southern Railway bridge and to Ludlow. Empty outbound trains of this road, made up at Ludlow, will back into the station. All other trains which have to be reversed will be turned by passing around the loop.

To reach the group of freight yards lying along the river there is an incline from the east leg of the Y-viaduct and a loop incline from the approach to the Southern Railway bridge. The main lines at the west side of the terminal are at the freight-yard level. Between the station and Mill Creek are freight yards of the Baltimore & Ohio and the Chesapeake & Ohio and a large classification yard for the Southern Railway. This last road has also two team yards, at opposite ends of the terminal site. The line shown west of the creek is the old Cincinnati, Hamilton & Dayton, now the Toledo division of the Baltimore & Ohio. It will be used only for freight service, leading into the low-level yards along the river. The new Chesapeake & Ohio and Southern freight yards were built as one of the first steps in the construction program, since the old yards occupied part of the new station site.

Station Plan—Although only about 20 per cent of the trains pass through Cincinnati, the entire station is designed as a through station to afford greater flexibility of operation. Its present plan provides fifteen platform tracks and eight platforms, which will serve for 105 trains inbound and 105 outbound daily. Provision is made for a total of 22 tracks and 10 platforms, which will serve 150 trains each way. At present the total number of trains using the two main stations averages 91 inbound and 96 outbound daily.

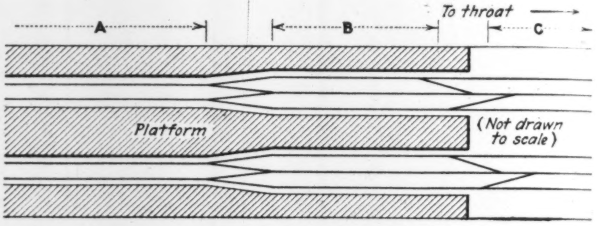


Fig. 4—Diagram of platform tracks

A shows track space for five cars and engine between switches of middle tracks; *B*, space for three or four cars; *C*, space for three or four cars and engine between throat and platform switches.

Tracks in pairs between the platforms are spaced alternately 13 ft. and 38½ ft. c. to c. The platforms are 1,100 ft. to 1,600 ft. long, the longer ones sufficing for trains of sixteen cars and engine, without interfering with switching at both ends and the internal crossovers. Longer trains may be placed by blocking these crossovers at one end or the other. These long tracks will provide also for two short trains pulling in or heading out in the same or opposite directions.

An exceptional and novel feature of the track layout is that near the ends of the platforms the tracks of each pair diverge from 13 ft. to 26 ft. c. to c. in order to admit a double-end siding between them. The platform width is correspondingly reduced to 15 ft. This arrangement for the north end of the station is shown in Fig. 3 and is explained diagrammatically in Fig. 4. It will permit set-out and pick-up movements and the interchange of cars between trains on adjacent tracks to be made without interference with switching movements through the throats. South of the station concourse, three cars can stand in the clear on each of the middle tracks, with the tail track available for shifting them to either of the platform tracks. North of the concourse the arrangement is similar, with room for from two to four cars to stand in the clear and with corresponding space for the switch engine to move with them. Both head-end and rear-end switching can be done with a minimum of interfering movements.

A concourse extends across the tracks with stairs and ramps leading from each side to the platform, as shown in Fig. 5. No passenger elevators will be provided. Concrete platforms, with their sides 9 in. above rail level,

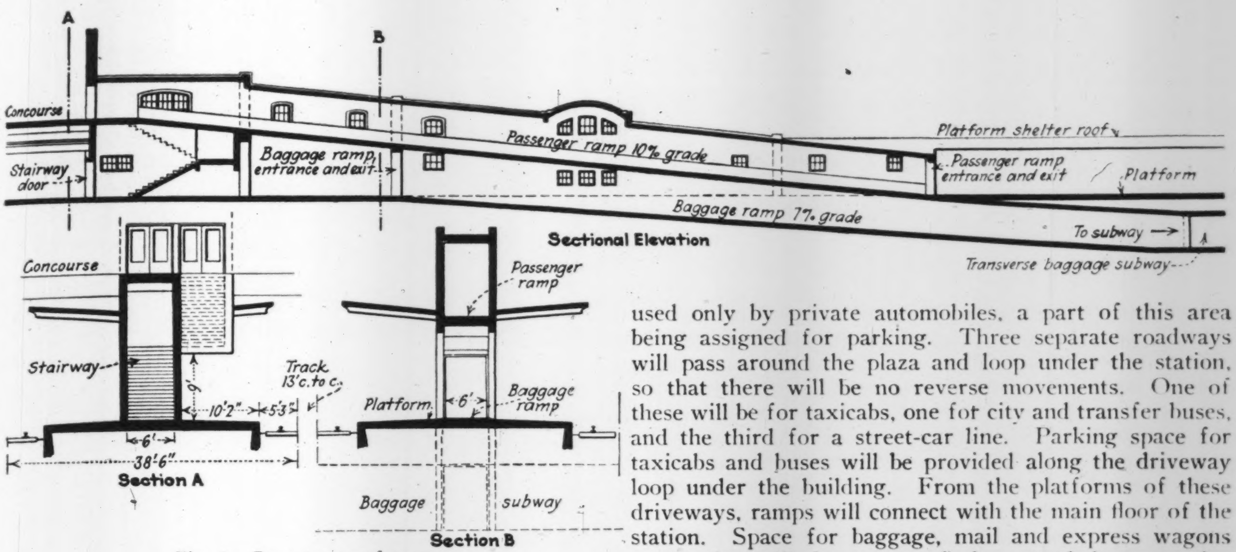


Fig. 5—Concourse and ramps

will be 28 ft. wide and the ramps and stairways 7½ ft. wide, leaving ample room on each side for trucking and passengers. The passenger ramps will have a grade of 10 per cent and the baggage ramps 7 per cent. Baggage will be handled by tractors and trailers on the passenger platforms, but the arrangement is such as to minimize interference. Trucking ramps leading from the platform to a baggage subway will be located under the north passenger ramps (Fig. 5). Both arriving and departing trains will ordinarily have the head end and baggage cars at the middle of the platform, near the entrance to the trucking ramps, while the passenger cars will be near the entrance to the passenger ramps.

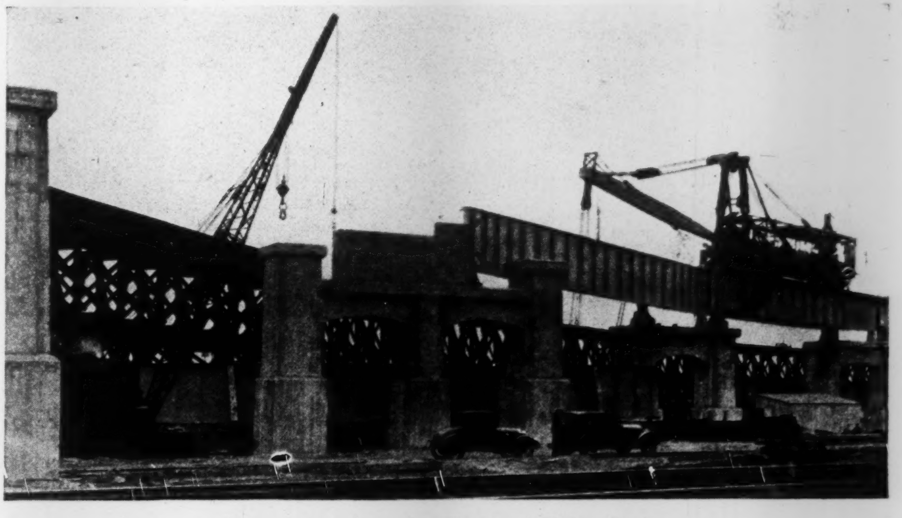
Station tracks will be laid with 130-lb. rails on creosoted ties in clean gravel ballast, and turnouts will have No. 10 frogs. There will be no trainshed, but each platform will have a butterfly shelter roof carried by a single row of columns spaced 80 ft. apart longitudinally.

Station and Plaza—Since the location of the passenger terminal is outside of the business district, no air-right development is projected, and the station building is planned simply for terminal purposes. However, the foundations are designed for a future eight-story building that would be occupied probably by railway offices. The main feature of the station will be a semi-circular dome-roofed hall about 170 ft. wide and 110 ft. high, around which will be the ticket offices, parcel and baggage rooms, restaurant and other station facilities and concessions. Beyond this will be the combined waiting room and concourse 80 ft. wide and 550 ft. long, spanning the platforms.

In front of the building will be a broad plaza to be used only by private automobiles, a part of this area being assigned for parking. Three separate roadways will pass around the plaza and loop under the station, so that there will be no reverse movements. One of these will be for taxicabs, one for city and transfer buses, and the third for a street-car line. Parking space for taxicabs and buses will be provided along the driveway loop under the building. From the platforms of these driveways, ramps will connect with the main floor of the station. Space for baggage, mail and express wagons or trucks will be arranged for at their respective buildings.

To provide an attractive boulevard approach the city plans to clear a space one block wide and six blocks long as an extension of the present small Lincoln Park. The station building will be a conspicuous structure, its main floor being about 30 ft. above the neighboring streets and approached on a variable grade not exceeding 6 per cent through the park and plaza.

Engine and Car Facilities—As the terminal company will undertake the servicing for all the railroads (except the Southern Railway, as noted), extensive facilities are provided adjacent to the station. For cleaning and storing passenger cars and for provisioning and servicing sleeping cars, there is to be a coach yard with 33 parallel tracks, 1,250 to 1,550 ft. long, connected at each end to a ladder track. These tracks will be in pairs alternately 14 and 18 ft. c. to c., with paved platforms between the pairs. Four inbound tracks in the engine terminal will be served by a coaling station and ashpits



West approach to the Cincinnati Union Station

Placing a girder for the viaduct approach of the Chicago line of the Chesapeake & Ohio Railway. This viaduct will replace the old timber trestle shown in the background. The trestle is used also by construction trains with material from Bald Knob for filling the station site. Note the way in which the derrick car has its outrigger support braced to the completed span. The tracks in the foreground are the Toledo division of the Baltimore & Ohio, which will be used only for freight service after the station is opened.

and will lead to two turntables, each serving an eighteen-stall engine house. The coaling station will also serve the two outbound engine tracks. Engine parking tracks and a small machine shop are to be provided.

Street Viaducts—The great length of the terminal affects many streets crossing the Mill Creek valley. Three old streets will be closed and the Harrison Ave. viaduct removed, but better facilities will be provided by the construction of the new Western Hills viaduct, a double-deck structure which will be paid for jointly by the city and the terminal company. South of the station Gest St. and Eighth St. (Fig. 2) will pass under the station approach and over the freight tracks beyond. At Sixth St. a complicated and dangerous grade crossing will be eliminated by relocating the street and carrying it over the tracks.

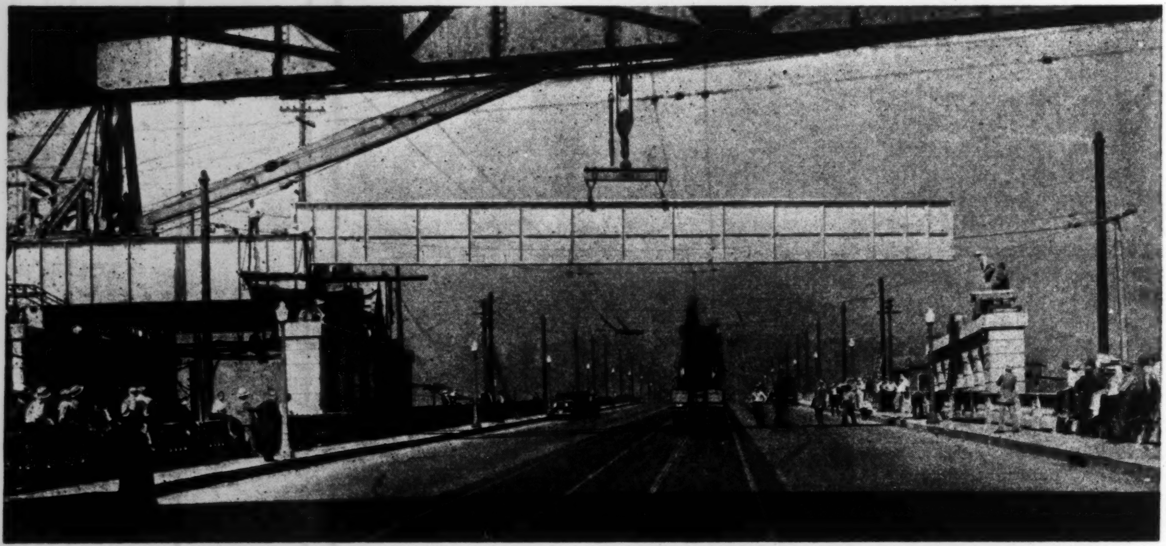
Grading the Site—Since the greater part of the site was bottom land subject to flooding with the Ohio River at 50-ft. stage, it was decided to fill this to 1 ft. above the maximum flood stage of 71 ft. For this about 6,000,000 cu.yd. was required, with a maximum height of fill of about 25 ft. Up to Sept. 1, 1930, about 2,500,000 cu.yd. had been placed. The west slope of the fill meets the Baltimore & Ohio embankment along the east side of Mill Creek.

To obtain material for this large fill the terminal company purchased practically the entire area of Bald Knob, a steep round hill just west of Mill Creek and rising about 200 ft. above the surface of the fill. The leveled ground may be developed by the company as an industrial site. This hill is composed largely of hard blue shale with thin strata of limestone. Blast holes are put down with well drills, but only light shots are fired. The contractors built a spiral track on a grade of 2½ per cent nearly to the top of the hill and installed two steam shovels to load trains of six 30-yd. dump cars, which are hauled to the Chicago line of the Chesapeake & Ohio. As this line has very heavy traffic the railway has an operator stationed in a tower at each end of that part of the line used by the dump-car trains. These trains are held on the contractor's sidings until they get orders to move over the main line.

An unusual practice in excavation of this kind is the use of shovels of the large type more ordinarily used in stripping coal and ore. Each shovel is of the full revolving type, mounted on a rectangular plate-girder frame with a four-wheel truck under each corner, requiring a double track in the pit. One machine has an 8-yd. bucket and the other 6-yd., but both handle about the same amount daily, owing to the somewhat quicker movement of the lighter machine. They work two ten-hour shifts daily. The fill is made by side dumping, the material being leveled by a spreader car and the dump track moved to the edge of the fill by power-operated track-shifter cars.

Although the shale disintegrates on exposure and turns to mud when wet, the dry season of 1930 has resulted in easier work and less settlement than was expected. Gravel for certain parts of the fill, where buildings and trainsheds are to be erected, is obtained at a distance of 16 miles, the Chesapeake & Ohio Railway's Indiana division furnishing engines and crews for the main-line haul. About 3,000,000 cu.yd. of common fill and 100,000 cu.yd. of gravel have been deposited.

Engineers and Builders—For the Cincinnati Union Terminal Co., the chief engineer is Henry M. Waite; with C. A. Wilson acting as consulting engineer; J. E. Root, special engineer; J. C. V. Christensen, engineer of design; and George P. Stowitts, engineer of construction. The architects for the station building are Fellheimer & Wagner, New York. All the grading is handled by the Winston Bros. Co., Minneapolis, Minn., and the tracklaying will be done by the Kershaw Contracting Co., Birmingham, Ala. The concrete piers and steel superstructures for viaducts already undertaken have been let to several contractors.



Setting one of the 76-ft. girders in the Southern Railway crossing over Eighth St.

Eighth St. is carried over the southern part of the terminal area on a viaduct. The approach tracks from the Southern Railway bridge over the Ohio River to the new station and to the Southern Railway classification yard, which are carried on a viaduct over the yards along the river, are carried over the Eighth St. viaduct to separate the street and railway grades.

River Niger Levee Project in West Africa

Modern draglines build 500-mile levee from Bamako to Timbuktu to protect rich cotton lands of the French Senegal south of the Sahara

By J. C. FRENCH
Sales Manager, Monighan Manufacturing Corp., Chicago, Ill.

A LEVEE-BUILDING operation of major magnitude is required in the developments by the French government to protect the rich agricultural lands of its West African territories from the annual floods of the River Niger. The Niger is the third largest river in Africa, and as is shown by the accompanying map, it rises within 150 miles of the west coast and loops 2,600 miles north and east to return again to the coast. The flood plain is in the upper reaches of the Niger, north of the river and south of the Sahara and between Bamako and Timbuktu.

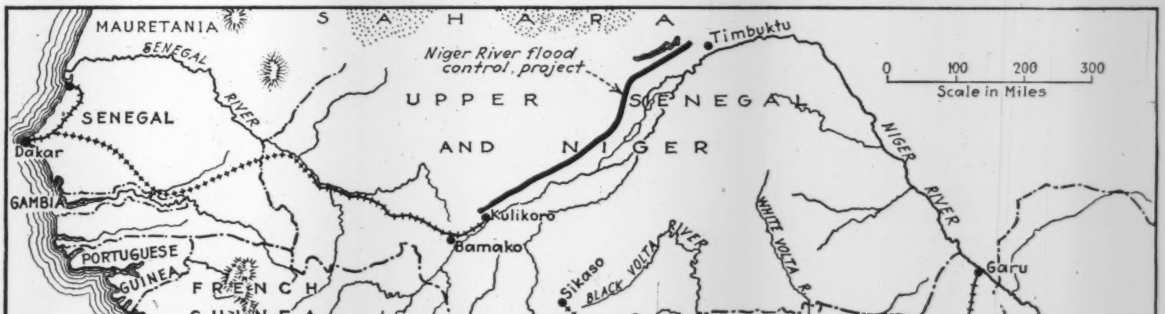
Flood Season and Climate

The Niger River rises in flood at Bamako in January as the result of the tropical rains, and subsides in April. The rise is rapid and unites all of the lakes within the valley between Bamako and Timbuktu so as to form a single lake of vast proportions. The valley country consists of patches of forest, but in general the land is open and well adapted to agriculture and stock raising. Agriculture is in a very primitive state, but the French government has introduced cotton, to the cultivation of which the climate and ground conditions have been found unusually well adapted.

Buildings for white workers and engineers

There are wet and dry seasons. The rainy or wet months are simultaneous with the American summer. In the rainy season the wind blows from the sea, and in the dry season the winds from the Sahara Desert sweep seaward and the heat is excessive, averaging 95 to 105 deg. The rainy season starts about June 27, and the heat and humidity render the country unhealthy with malaria and other fevers. The dry season starts about the last of October and lasts until late in June. From April until July, however, there is rainfall at frequent intervals.

In order to correct the flood conditions of the Niger valley between Bamako and Timbuktu, the French government has in hand levee construction on the northwestern bank of the river. The work is under the direction of the French army, and the division for control is the "Service Travaux Irrigation Niger."


MAURETANIA
SAHARA
Niger River flood control project
Timbuktu
0 100 200 300
Scale in Miles
SENEGAL RIVER
UPPER SENEGAL AND NIGER
SENEGAL
Dakar
GAMBIA
Kulikoro
Bamako
PORTUGUESE GUINEA
FRENCH GUINEA
Sikaso
BLACK VOLTA RIVER
WHITE VOLTA R.
NIGER RIVER
Garu
Zungeru
NORTHERN TERRITORIES
OTI RIVER
TOGO LAND
DAHOMEY
NIGERIA
Konakry
SIERRA LEONE
Freetown
ATLANTIC OCEAN
LIBERIA
IVORY COAST
SASSANDRA RIVER
BANDAMA R.
ASHANTI
VOLTA RIVER
Lome
Porto Novo
Monrovia
GOLD COAST
Accra
Newtown
GULF OF GUINEA
Akassa

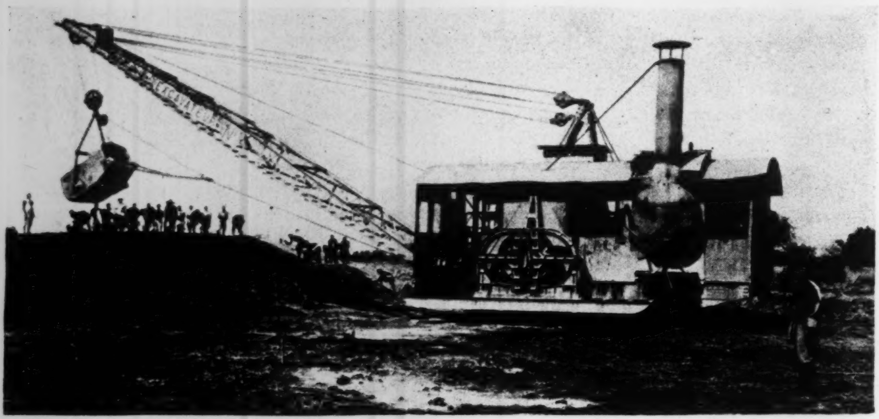
French West Africa and the Niger River levee being built by the government

The levee has a 45-ft. base, with 1 on 1 side slopes, and a crown width of approximately 33 ft. River silt is obtained from each side and covers the ground to a thickness of 6 to 8 ft. The borrowpit requirements are dictated by the soil conditions. A 10-ft. berm is left on each side of the levee, and the average height of the structure is 6 ft.

The sunbaked ground of the valley in the dry season is very difficult to excavate and handle, and the extremely slow progress of the negro labor induced the French officials to investigate excavating machinery of modern types for the work. A steam-type, wood-burning, dragline excavator was adopted.

This excavator was received in Africa at Dakar in September, 1927, and was loaded for shipment on the narrow-gage railroad to Kulikoro on the Niger River. It was then loaded upon barges and towed to a place called Kayo on the northwest bank of the river about half way between Bamako and Timbuktu. Kayo is located in the very interior of French West Africa and is populated entirely by negroes.

Niger River levee and borrowpit



Wood-burning steam dragline for Niger River levee

The dragline was shipped knockdown and in crates, and after being unloaded was assembled with the aid of several hundred negroes and moved under its own power to a point about 3 miles from the town to start the levee building. This levee-building program, in accordance with the French government plan, includes the construction of a continuous levee from Bamako to Timbuktu, a distance of approximately 500 miles. The time schedule for the entire project is 50 years.

The first dragline machine started from a point near Kayo and worked northeast toward Timbuktu, and the success obtained encouraged the French government to order a second machine. This second machine is identical in size and type and arrived at Kayo in August, 1929. It was placed in commission on the work at the point of the starting of the first machine, and with it the levee was continued southwest towards Bamako. This arrangement means that each machine will work and move away from the other, and a complete levee will be erected at the center of the flood area. During the flood seasons the machines are placed on top of the levees they have erect and above the water limits.

The dragline machines operate eighteen hours a da with two nine-hour shifts during the working season o six months. After the rains begin, the machine is worke only one shift of nine hours and only during the daytime. As soon as the continuous tropical rains of the wet seaso begin to fall, all work ceases and the machines are place in condition for protection against high water, rust, etc.

During the working season the machines averag 50,000 to 60,000 cu.yd. per month, which is very sati factory considering the disadvantages of the workin conditions and the labor. The maintenance has bee negligible, but a stock is carried to insure the necessary repairs for continuous operation and yardage.

Forty negroes are placed upon the levee with shovels and tampers to shape the structure and tamp the materials. Forty other negroes are stationed ahead of the machine to cut wood for the boiler and to carry the necessary water from the Niger, which is located approximately 1,500 ft. away during the dry season. Two white men operate the machine with a crew of negroes for oilers and firemen. The white men are soldiers of the French army under Colonel Doizelet, in charge of the levee building operations as resident engineer.

Living and Working Conditions

Camps are arranged for the white men and are located at a considerable distance from the negro villages. Each is garrisoned by five soldiers and one civilian doctor. The food consists principally of game and fish, shot and caught in the district. Some canned goods are brought into camp, especially fruits. Deer and rabbits are plentiful, and during the rainy season duck and geese are obtained daily.

The houses or huts are built by the negroes and are made 4 ft. thick to keep out the heat. The roofs consist of straw, laid in bundles in a manner similar to the laying of shingles, and are generally 2 ft. thick. These houses do not afford any protection from the insect world, especially mosquitoes, which, with plagues of grasshoppers and millions of flies of all descriptions and sizes tend to make the life of a white man far from enjoyable.

The Epitaph of 444 Railroads

Abandonment of 6,400 miles of railroad in the past ten years stimulates search for a cause. Is it bus and truck competition? This study answers no, and blames depletion of natural resources

By IRVIN D. FOOS
Washington Office, Engineering News-Record

OUR railroad population is decreasing, but recently the birth rate as well as the death rate has increased. In 1916 there were 254,037 miles of road in the United States. That was the peak. A net reduction of 4,906 miles brought the total down to 249,131 miles in 1927. It was inferred that the railroads were going into a decline, but successive net increases in mileage in the past three years, although small, indicate that this downward trend has been checked, at least temporarily. Abandoned mileage continues to increase from year to year, but new construction is adding more miles than are junked.

In 1930 the construction of 1,596 miles of roads was authorized by the Interstate Commerce Commission. Abandonments amounted to less than half that figure (Table VII). In the ten-year period since enactment of the transportation act (Interstate Commerce Act, as amended, Sec. 1, Par. 18) providing for the issuance of certificates of public convenience and necessity by the commission in all cases of contemplated abandonment or construction of lines, new construction authorized by the commission totals 9,492 miles and abandonment 6,400 miles.

The total road mileage of 249,433 in 1929 does not reflect the spurt in construction, as there usually is a spread of a year or more between the date that construction is authorized and the time when the new track is actually placed in operation. Abandonment of railroad lines and branches, on the other hand, generally follows within a short period after authorization by the commission. Some construction authorized by the commission may never materialize. To some extent the same is true of abandonment of mileage, but for the purpose of this analysis the commission's statistics, based on certificates authorizing construction or abandonment, will serve, with the exceptions noted with respect to abandonment in the foot-note on Table VII.

No comprehensive data are available on railroad abandonment prior to the enactment of the transportation Act, Feb. 28, 1920, but fortunately the information available since that year covers a period (Table I) that has witnessed the major development of motor transportation, a factor to which the abandonment of railroad mileage is commonly attributed.

The records in abandonment proceedings, examined for the specific purpose of determining the primary causes of railroad abandonment, indicate clearly, however, that motor competition is of relatively small weight as a primary cause of the abandonment of railroad mileage (Table VI). The records indicate further that where motor competition is the prime cause, it is the private passenger car and truck and not the commercially operated truck and bus that are responsible.

This study to determine the nature and significance of the abandonment of railroad lines and branches was first undertaken by Henry R. Trumbower, an economist of the U. S. Bureau of Public Roads. Mr. Trumbower's survey covered the period from enactment of the transportation act in 1920 to May 1, 1925. He reported that motor competition was accountable for the abandonment of ten lines or branches, or 8.4 per cent of the total of 120 abandonments. On a mileage basis the competition of motor vehicles was found to be the cause for abandonment of 104 miles of line, or 4.3 per cent of a total of 2,438 miles. Since 1925 motor competition has become much more extensive and intensive, and the analysis, when carried down to date, discloses that in the ten-year period from 1920 to 1930, inclusive, the abandonment of 72 rail lines and branches, or 16 per cent of a total of 444, should be laid to the death-dealing effect of motor competition on railroad traffic. The mileage involved amounted to 891 miles, or 14 per cent of the total of 6,400 miles abandoned since 1920.

This increase in the extinction of rail lines due to motor competition is significant but does not overshadow the fact that abandonment of 84 per cent in number and 86 per cent in mileage of rail lines and branches must be otherwise accounted for. The lack of sufficient traffic to continue making operation profitable, or even possible, is, of course, the fundamental reason for abandonment. Shippers and passengers abandon the lines before the railroads do. The causes for the disappearance of traffic are many and various. Flood, fire, the boll weevil, prolonged drought, establishment of forest reserves, decreasing rural population, and shifts in industry are cited as controlling causes in some instances, but the primary causes are: (1) depletion of natural resources; (2) competition of other railroads; (3) the competition of motor vehicles; and (4) the rearrangement of railroad lines, which for the purpose of this classification embraces both the construction of cutoffs and changes in routing to facilitate movement of traffic or to reduce the cost of transportation.

Wasteful Construction

It is plain from reading the tragic history of many of the abandoned roads that they should never have been built. Unscrupulous promoters and the pride of pioneers built mile upon mile of road in territory that never could support them adequately. They were headed for the junk pile from the start even if, as Mr. Trumbower pointed out in 1925, highway transportation had not entered as a competitive factor. But such retrospection is futile. Interest lies only in the more or less immediate causes of abandonment. In authorizing the abandonment of a line, says the commission, the motives that induced the promoters to construct it are not material after years have elapsed since that event. The use in the nearer past and particularly the present use made and the prospective use to be made by the people of the territory through which it operates, the effect upon them and upon the transportation system of such operation are the controlling circumstances upon which the commission's decision must rest. (145 I.C.C. 355).

The advent of motor vehicles operating over improved highways has been a blessing to many roads because it has relieved them of the necessity of operating unprofitable lines that could not be abandoned as long as they were the only means of transportation in the territory served. Abandonment was permissible as soon as the highways took so much of the traffic that there was scarcely any left for the decrepit rail lines to carry.

As more than half the mileage scrapped is due to the depletion of natural resources, the abandonment of railroads can be attributed, to this extent, to natural causes. A majority of the 444 lines and branches that have been abandoned were originally built for the purpose of tapping timber or mineral resources, which contributed traffic both in the form of raw materials and their manufactures. The classification in Table V shows not only the purpose for which the abandoned roads were constructed but also indicates the manner in which they came into being. The tendency to build separate and individual lines of railroad to tap mineral resources was not as marked as the tendency to build such lines in order to market timber products. This is revealed by the fact that of the 167 so-called logging roads abandoned, 64 were separate lines and 103 were branches, while of the 95 mining roads abandoned, 18 were lines and 76 were branches. Both the logging and mining lines were built, in most cases, by those engaged in the exploitation of these resources, while the branch lines were generally constructed by railroads which sought in this manner to obtain additional traffic and to meet the needs of shippers. Many of the mining and logging roads, the latter especially, have numerous joints marking the progress of construction into virgin territory with the depletion of resources in the territory tributary to the original branch. Finally, left in the midst of cut-over timber lands practically destitute of population, many of these lines and branches had no hope of receiving traffic from any source in sufficient quantity to justify continued operation. As the I. C. C. laconically concludes in scores of reports authorizing abandonment: The line has served the purpose for which it was built and its continued operation would be an unwarranted burden to the applicant and to interstate and foreign commerce.

TABLE I—MILEAGE OF RAILROAD LINES AND BRANCHES ABANDONED

A		Lines		Branches		Total	
1920-25*		No.	Miles	No.	Miles	No.	Miles
From Nov. 1,	1920	1	30.30	3	23.97	4	54.27
	1921	14	548.12	20	144.82	34	692.94
	1922	9	387.56	15	196.05	24	583.61
	1923	6	305.30	14	152.39	20	457.69
	1924	7	180.70	19	248.38	26	429.08
To May 1,	1925	4	157.65	8	63.71	12	221.36
Total		41	1,609.63	79	829.32	120	2,438.95
1925-1930							
From May 1,	1925	9	365.400	32	330.528	41	695.928
	1926	14	333.693	31	291.143	45	624.836
	1927	13	214.016	40	422.631	53	636.647
	1928	7	122.703	51	393.680	58	516.383
	1929	12	341.596	40	354.346	52	695.942
To Dec. 31,	1930	14	196.353	61	595.719	75	792.072
Total		69	1,573.761	255	2,388.047	324	3,961.808
From Nov. 1, To Dec. 31,	1920 1930						
Total		110	3,183.391	334	3,217.367	444	6,400.758

*The record covering this period was compiled by Henry R. Trumbower economist of the U. S. Bureau of Public Roads, and accompanied an article written by Mr. Trumbower for the October, 1925, number of *Public Roads*, the bureau's journal of highway research.

†

TABLE II—DISTRIBUTION OF RAILROAD ABANDONMENTS BY GEOGRAPHIC SECTIONS,*1920-1930

	Lines			Branches			Total		
Group of States	Number	Miles	Average Length	Number	Miles	Average Length	Number	Miles	Average Length
New England	3	60.640	20.213	24	129.950	5.414	27	190.590	7.059
Middle Atlantic	6	95.918	15.986	38	225.396	5.931	44	321.314	7.302
East North Central	14	784.960	56.068	79	917.854	11.618	93	1,702.814	18.310
West North Central	8	434.850	54.231	28	292.366	10.441	36	727.216	20.200
South Atlantic	26	631.960	24.306	36	270.446	7.512	62	902.406	14.555
East South Central	12	299.220	24.935	26	277.437	10.670	38	576.657	15.175
West South Central	26	498.280	19.164	36	316.404	8.789	62	814.684	13.140
Mountain	7	177.030	25.290	31	436.330	14.075	38	613.360	16.141
Pacific	8	200.533	25.067	36	351.184	9.755	44	551.717	12.539
Total	110	3,183.391	28.940	334	3,217.367	9.603	444	6,400.758	14.416

*New England States: Maine, New Hampshire, Vermont, Massachusetts, Connecticut and Rhode Island. Middle Atlantic States: New York, New Jersey and Pennsylvania. East North Central States: Ohio, Indiana, Illinois, Michigan and Wisconsin. West North Central States: Minnesota, Iowa, Missouri, North Dakota, South Dakota, Kansas, and Nebraska. South Atlantic States: Delaware, Maryland, West Virginia, Virginia, North Carolina, South Carolina, Georgia and Florida. East South Central States: Arkansas, Oklahoma, Louisiana, and Texas. Mountain States: Montana, Idaho, Wyoming, Utah, Colorado, New Mexico, Arizona, and Nevada. Pacific States: Washington, Oregon, and California.

The mortality among narrow-gage lines has been exceedingly heavy.

New Industries Fail to Develop

The purpose for which the abandoned roads were constructed has not been taken as a controlling factor in determining the cause of abandonment. It is evident, particularly with respect to logging roads built in recent years, that some railroads entertained the hope that depletion of timber would be followed by a substantial development of other industries. A few roads have been able to survive during this period of transition, as other developments have kept pace with the cutting of timber that have furnished sufficient traffic to sustain operation of the line on a profitable basis. Where motor competition or other causes have subsequently robbed such lines of traffic, their abandonment is, of course, attributed to such causes; but where, as the record in abandonment proceedings discloses almost invariably, the line or branch has operated at a deficit ever since disappearance of the traffic which the road was built to haul, its eventual abandonment is laid to depletion of such natural resources, although motor competition has contributed to the decline in rail traffic. In all cases, except where the residents of a territory have moved out with the shut-down of mining or logging operations, the loss of passenger traffic is due to the automobile, but this was only an incidental source of revenue to the great majority of the roads abandoned. The rule uniformly applied in determining the cause of abandonment is whether in the last analysis the line would have ceased operation if motor competition had not figured in the actual abandonment. Although many roads have suffered from a complication of ailments, it is usually easy to determine whether their existence was vitally dependent upon the traffic received from the industry they were built to serve.

Conditions inherent in the business of railroad transportation account for the abandonment of considerable mileage. The competition of other railroads is diminishing in importance as a primary cause, but what can best be described generally as rearrangement of lines is assuming great significance. Although its total effect is not as great as motor competition, it has come to the front as one of the primary causes of abandon-

TABLE III—COMPARISON OF ABANDONED RAILROAD MILEAGE, 1920-1930, WITH TOTAL RAILROAD MILEAGE (MILES OF ROAD), AS OF DEC. 31, 1919

Section	Total Miles of Road, Dec. 13, 1919	Total Mileage Abandoned, 1920-1930	Abandoned Mileage Per 1,000 Miles of Road
New England	7,985.590	190.590	23.867
Middle Atlantic	22,362.170	321.314	14.368
East North Central	44,868.750	1,702.814	37.951
West North Central	52,176.460	727.216	13.937
South Atlantic	32,434.560	902.406	27.822
East South Central	17,783.910	576.657	32.425
West South Central	32,972.640	814.684	24.707
Mountain	25,314.650	613.360	24.229
Pacific	17,253.440	551.717	31.977
Total	253,152.170	6,400.758	25.284

TABLE IV—ABANDONED RAILROAD LINES AND BRANCHES, 1920-1930, CLASSIFIED ACCORDING TO LENGTH

Length, Miles	Number of Lines	Number of Branches	Total
0- 4	8	135	143
5- 9	20	90	110
10- 14	19	40	59
15- 19	13	31	44
20- 24	10	11	21
25- 29	10	11	21
30- 34	3	5	8
35- 39	3	6	9
40- 44	7	..	7
45- 49	1	..	1
50- 54	4	1	5
55- 59	..	2	2
65- 69	2	1	3
75- 79	2	1	3
90- 94	2	..	2
95- 99	3	..	3
160-164	2	..	2
230-234	1	..	1
Total	110	334	444

TABLE V—RAILROAD ABANDONMENTS, 1920-1930, CLASSIFIED ACCORDING TO PURPOSE OF CONSTRUCTION

	Lines		Branches		Total	
	Number	Miles	Number	Miles	Number	Miles
Logging roads	64	1,269.070	103	1,106.023	167	2,375.093
Mining roads	19	546.435	76	690.783	95	1,237.218
Logging and mining roads	83	1,815.505	179	1,796.806	262	3.612.311
All others	27	1,367.886	155	1,420.561	182	2,788.447
Total	110	3,183.391	334	3,217.367	444	6,400.758

ment even more rapidly. Abandonments assigned to this cause are the result of the revision of lines to eliminate excessive grades or curvatures, the construction of cut-offs, or new short lines, and the acquisition of control of one road by another, permitting elimination of duplicate facilities. The abandonment of mileage incident to these developments may be regarded, on the whole, as a positive symptom of the healthy condition of the nation's rail-transportation system. It is evidence also of an increase, rather than retrogression, in the ability of the railroads to serve the public.

Abandonment Not Excessive

Considered apart from the total railroad mileage of 249,433 miles, the abandonment since 1920 of 6,400 miles appears large. This is an average of 640 miles a year in the ten-year period. Considered in its true proportions, however, the abandoned mileage is not excessive. For the country as a whole it amounts to 25 miles per 1,000 miles of road (Table III). The total is spread over 110 lines and 334 branches, and 58 per cent consisted of short stretches less than 30 miles in length (Table IV). It should be explained that in classifying abandoned mileage according to lines and branches, line abandonments are those which involve abandonment of a whole line of road; branch abandonments include those which involve abandonment of a portion of the railroad's line of road or one of its branches. The average length of abandoned line was 28.9 miles and of the abandoned branch was only 9.6 miles. Only 16 lines and 21 branches have been abandoned which were 50 miles or more in length, and the longest was 234 miles—the Chicago, Peoria & St. Louis Railroad.

The abandoned mileage is not confined to any particular section of the country. In every state except Delaware there have been some abandonments, although no mileage was relinquished in Idaho, Kansas, Kentucky, Maryland, Missouri, Nebraska and Utah from 1920 to 1925. Conversely, no mileage has been abandoned in Connecticut, Rhode Island, and North Dakota, since 1925. Twice as much rail mileage has been abandoned in the East North Central states as in any other one section of the country. This was due in large measure to the abandonment of numerous mining and logging roads in Michigan and Wisconsin and of two long lines of road, the Indiana coal division of the Chicago & Eastern Illinois, 162 miles, and the Chicago, Peoria & St. Louis Railroad in Illinois with its 234.3 miles of line. Abandonment in the East North Central section also exceeds that of other sections in the rate per 1,000 miles, averaging 37.95 miles (Table III).

Depletion of Timber Resources

Abandonment of mileage has increased considerably in South Atlantic states in recent years coincident with the depletion of timber resources in North Carolina, Georgia and Florida. Abandonment of the Macon & Birmingham, a 96-mile line in Georgia, also served to bring up the total in this area. The South Atlantic states rank fourth, however, from the standpoint of the rate of abandonment per 1,000 miles of road.

The classification of abandoned mileage according to geographical location (Table II) indicates a shift that roughly seems to follow the course of railroad development. The abandonment of mileage in the New England and Middle Atlantic states since 1920 has been very small. This may indicate either that the greater part of unprofitable mileage was eliminated prior to 1920 or that the density of population and intensive industrial operations provide the railroads with sufficient traffic to meet successfully the competition of other forms of transportation. Several resort roads in New England and New Jersey have been abandoned because of passenger traffic lost to motor transportation, but the mileage is small.

The relative positions that the various sections of the country occupy with respect to loss of railroad mileage is revealed by the order in which they stand at the close of the ten-year period as compared to their position at the end of the five-year period. The East North Central states stood first in the abandonment of mileage at the close of both periods; West South Central states, second in 1925, were third in 1930; Pacific states were third in 1925, seventh in 1930; East South Central states were fourth in 1925 and sixth in 1930; South Atlantic states were fifth in 1925, second in 1930; West North Central states were sixth in 1925 and fourth in 1930; the Mountain states moved up from seventh to fifth place, and the Middle Atlantic and New England states remained in eighth and ninth positions.

The Interstate Commerce Commission does not invariably approve applications for abandonment. The burden of proof is on the railroad to show that the line or branch proposed to be abandoned is no longer essential to public convenience and necessity. A showing that the line or branch is operated at a deficit is not always sufficient to overcome the objections of shippers served by the road. In numerous cases the commission has held authorization to abandon in abeyance, thus, in effect, warning shippers that they must furnish sufficient traffic to make continued operation possible.

TABLE VI—PRIMARY CAUSES OF LACK OF TRAFFIC

Cause	Number of Railroads	Per Cent of Number	Mileage	Per Cent of Mileage
Depletion of natural resources	242	54.5	3,381.017	52.9
Competition of other railroads	36	8.1	1,101.493	17.2
Competition of motor vehicles	72	16.2	891.760	13.9
Rearrangement of railroad lines	60	13.5	468.444	7.3
Miscellaneous	34	7.7	558.044	8.7
Total	444	100.0	6,400.758	100.0

TABLE VII—RAILROAD MILEAGE ABANDONED AS COMPARED WITH MILEAGE CONSTRUCTED, 1920-1930

Year	Abandoned* Number	Abandoned* Miles	Constructed† Number	Constructed† Miles
1921	38	747.210	20	404.705
1922	24	583.610	27	444.330
1923	20	457.690	28	881.590
1924	26	429.080	26	1,318.350
1925	53	917.288	46	908.840
1926	45	624.836	52	1,573.700
1927	53	636.647	39	1,027.270
1928	58	516.383	33	717.192
1929	52	695.942	45	618.198
1930	75	792.072	54	1,596.010
Total	444	6,400.758	370	9,492.185

*Except for some abandoned mileage, approximately 270, involved in applications for certificates of public convenience and necessity, dismissed by the I.C.C. for want of jurisdiction, the figures include only miles of road, actual abandonment of which was expected to follow authorization by the commission. The commission's statistics on abandonment include agandonment of trackage rights; also lines and branches that, abandoned by one carrier, are taken over and operated by another. For example, in the reorganization of the Delaware & Hudson system, the D. & H. Co. was authorized to abandon operation of 881 miles of road, and this figure is included in the commission's statistics, although operation of the lines was immediately assumed by the D. & H. Railroad Corp. The commission's statistics also include, in some instances, mileage covered by certificates subsequently revoked. For these reasons the commission's statistics on railroad mileage certified for abandonment are higher than those presented above. Railroad mileage certified for abandonment, as reported by the commission, totaled 7,214.881 in the ten-year period from 1920 to 1930.

†The figures on construction are those reported by the commission as authorized by its certificates of public convenience and necessity.

The commission has suggested, notably in denying the application of the Colorado and Southern Railway (166 I.C.C. 470) to abandon 19 miles of its Platte Canyon line south of Denver, that the state cooperate in assuring continuation of service by reducing taxes. Commissioner Ernest I. Lewis elaborated on this suggestion by stating that if the federal government is willing to lessen taxation on newly constructed lines in order to fill out an adequate system of transportation, other political units may justify lessening the tax burden for the purpose of saving established and needed lines. He pointed out that such political divisions are faced with the fact that abandonment not only reduces taxable railroad property but depresses the territory served and lessens the ability of this property to continue to pay taxes. Commissioner William E. Lee took issue with the majority of the commission on this question, declaring that no railroad should be relieved of its fair share of the tax burden, and pointing out that the commission has no jurisdiction over the taxation of railroads by a state.

Making Way for a Highway

In some cases abandonment has been authorized upon the condition that the road will cooperate in facilitating local highway improvements, either by continuing to operate for a short period or turning over to state or county authorities any part of the line required. It frequently happens that the last car of freight hauled by a road is sand, gravel or cement for the highway that is to take its place. Occasionally, the railroad has conveyed, by its prerogative of quit-claim, its roadbed for use as a highway.

Striking by their rarity are cases in which the railroad has undertaken to provide substitute service by bus or truck. It may be argued that by using a little foresight in this direction the railroads would be able to hold on to traffic in territories where, for instance, the transition from logging to farming promises increased development in the future. The reason that the railroads do not avail themselves of the use of the highway in such cases probably is that development of traffic in this transition period is exceedingly slow. Progress is dependent largely upon the growth of population, an uncertain factor when the tendency of the rural population generally is to move to the city.

Under somewhat similar circumstances the Carson County Railway in Utah, awaiting the development of coal deposits owned by the federal government, sought to bridge the gap be requesting authorization to suspend operation in interstate commerce (124 I.C.C. 119). The road explained that it did not seek a permanent abandonment and would be willing to resume its status as an interstate carrier when conditions should warrant it, but contended that it should not be burdened with the necessity of complying with the many requirements exacted from interstate carriers and the heavy expense which they entail, when there is no corresponding benefit to the public. The road's proposal to meet the situation in this way was plainly repugnant to the commission, which, evidently feeling that this was an attempt to trifle with its authority, held that railroad companies should not be permitted to regard their status as common carriers engaged in interstate commerce merely as a garment to be worn or cast aside at will to meet the exigencies of traffic at any particular time.

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Strength of Hollow-Unit Masonry

That the strength of masonry made up of hollow units may be roughly predicted from a knowledge of properties of its constituents has been determined as the result of a series of tests of large specimens reported in University of Illinois Bulletin No. 27 and Technologic Papers Nos. 238 and 311 of the U. S. Bureau of Standards. These reports carry unusually complete data on the physical tests and on the methods of construction and workmanship of the test units, which were similar in size and in arrangement of units, or bonding, to ordinary building walls.

For walls with hollow units laid on end (cells vertical) it was found that compressive strengths were aproximately proportional to the relative sectional areas of the blocks given a direct bearing at the mortar joints. This proportion depended upon the design of the units and the workmanship of the masons. As regards other factors, the wall strengths varied as the one-half powers of the compressive strengths of the units (on gross area) and of mortar specimens. Expressed as an empirical equation, $M = b\sqrt{um}$, in which M = compressive strength of the wall, b = the ratio of area in direct bearing at the bed joints to the gross area of the unit, u = compressive strength of the units, and m = compressive strength of the mortar. This relation indicates that properties of a wall other than the compressive strength of the units used must be considered for even a rough estimate of its compressive strength.

For masonry walls with hollow units placed on their sides, strengths were found to be dependent on the following factors: (1) mortar mixture, (2) compressive strength of units, (3) workmanship, and (4) ratio of thickness of bearing shells to spans between vertical shells or webs. There seemed to be no simple way of evaluating the effects of workmanship with this type of wall.

Cellular Corewalls for Embankment Dams

New type of wall developed in Mexican projects prevents leakage water passing through into the downstream fill by draining it away through the vertical cells — A reinforced rubble prototype

By C. H. HOWELL
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IN THE STUDIES made for certain dams for the national irrigation commission of Mexico by the Mexico office of The J. G. White Engineering Corp., S. en C., there has been developed a type of corewall which is new, so far as is known to the writer. It is thought that a description of it may be interesting.

This wall consists of a row of vertical cells. Each cell drains into a longitudinal conduit in the base of the wall, discharging into outfall drains at convenient places. As any water passing through the upstream sides of the cells is thus discharged, the arrangement practically insures that the portion of the dam below the corewall will be dry. The downstream portion cannot become wet unless a head is built up inside the cells sufficient to force water through the downstream walls, which is impossible if the drains are of correct proportions.

The cells and drains permit of inspection, which is a desirable feature in any dam and an unusual one in embankment dams. Further, the wall is much stiffer than a solid wall having the same volume of concrete.

Arched sides for the cells are more economical than flat ones. They can be designed to eliminate tensile stresses and therefore the theoretical necessity for reinforcing steel. The minimum thickness required for resisting percolation will generally be found adequate for reasonable arch stresses. The amount of concrete required for this type of core is not much greater than would be used for a conservatively designed solid wall. The form cost is greater, but it will not be excessive if the forms are designed so as to permit their repeated use.

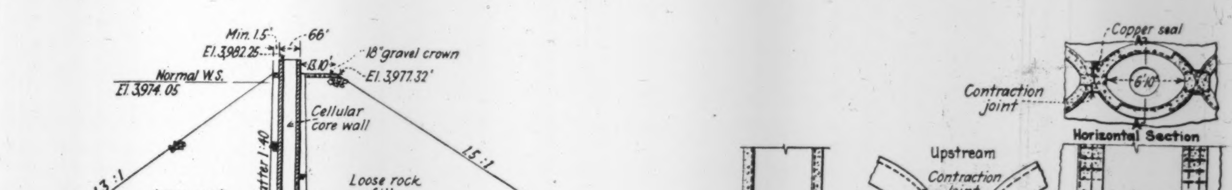
The idea of a cellular corewall was put in practice in 1917 to 1919 in the construction of the Requena Dam, about 50 miles from Mexico City. This dam is a composite structure about 100 ft. high, loose rock fill downstream of the corewall and a previous mixture of earth and rock upstream. Porous pipes placed in the latter close to the corewall show water surface at reservoir elevation, any changes in which are immediately shown in the former. This proves that the corewall is under full reservoir pressure. The wall itself is built of rubble masonry *with reinforcement of steel bars.* The cells, about 5 ft. long and 2½ ft. wide, are separated by partitions about 18 in. thick. The sides are about 2½ ft. at the top and probably batter out lower down (not definitely known). The wall is reported to be founded on and embedded 6 or 7 ft. in stiff yellow clay. It is about 600 ft. long.

Many of the cells are practically watertight. Others show considerable leakage. In one cell there is a rather large leak coming through the downstream wall below the natural ground surface, which undoubtedly comes through or under the cutoff below the horizontal conduit. The total leakage at the outfall is about 8 sec.-ft. with about a 70-ft. head.

The outlet conduit passes through the longitudinal drain conduit of the corewall at right angles and causes a heading up in the latter. The joint between the two conduits is cracked, and this permits some water to escape from the longitudinal conduit and follow along the irrigation outlet so that it shows up at its lower end as a small seep. Otherwise the entire downstream portion of the dam is dry and the adjacent ground is dusty.

These facts illustrate the efficiency of this particular corewall. They also are believed to indicate that a well-designed and well-built cellular corewall with a tight cutoff will insure a dry embankment below it regardless to a great extent of the kind of materials used and regardless of the way they are placed. The cellular corewall should therefore merit consideration in the designing of embankment dams.

Details of a cellular corewall for a 75-ft. rockfill dam are shown on the accompanying sketches. It will be noted that a moderate amount of reinforcing steel has been provided arbitrarily. The wall, being embedded in the embankment, will not be subject to large temperature changes. This is the most favorable condition for "permanence" of thin concrete structures.

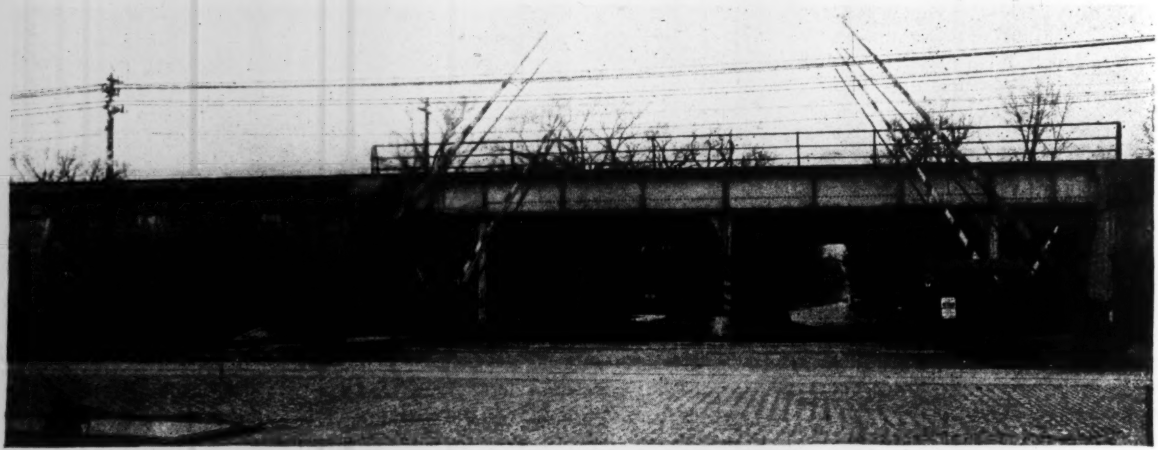


Design of earth dam with cellular corewall, Conchos irrigation project, Mexico

Grade Separation in Large Cities

A review of the problems of complicated interrelations of railways, cities, public utilities and private interests; of track elevation versus depression; of cost distribution and types of structures in general use

By E. E. R. TRATMAN
Western Editor, Engineering News-Record



Chicago track elevation, C. & N. W. Railway

Suburban type, Lake St. and Long Ave.; retaining wall with earth slope above; deck bridge with center and curb-line supports. The gates are for surface line of Lake St. elevated railway.

AMONG major railway improvements an item of increasing importance is the separation of grades in cities, projects of this kind being usually complicated and costly, since they involve not only the city and the railroads but also many private property owners, public utilities and manufacturing industries. These projects, numerous and widely distributed, will continue to increase with the expansion of residential and industrial districts and the ever-growing traffic on the streets. In general, the interests of the city and the railroad are somewhat opposed, although there may be benefits to both parties. Certain factors enter into consideration in every case: (1) convenience and safety of street and railway traffic; (2) advantages and disadvantages for the city and the railroad; (3) present and prospective conditions as to crossing traffic, accidents and protective measures; (4) changes in grade as affecting traffic, abutting property, sewers, water mains and other utilities; (5) effects upon industries; (6) suitable type of construction; (7) cost and its distribution.

Convenience and Safety

Although grade separation projects are advocated or promoted mainly on the basis of safety for street traffic as the primary consideration, the real basis is usually the convenience of that traffic by eliminating interference at the crossings. As a typical case, study of an important crossing in a city of 20,000 people showed that the gates were closed 70 times, with an aggregate closure of three hours during a ten-hour period. The number of persons thus halted each day was about 35 per cent of the population, and it was this continual delay, rather than the safety factor, which led to voting the city's share of the cost of grade separation. The safety and convenience of the traveling public must not be overlooked, since a long series of crossings is likely to involve delay to trains, while accidents certainly result in delay and inconvenience and perhaps injury to train passengers.

The degree of interference with and hazards to the street traffic depends upon local conditions, such as amount and character of traffic, frequency and speed of trains, occupation of crossings by standing trains or switching movements, approach grades and visibility of trains from the street. Traffic counts, records of delays and accidents, a study of the crossings and their surroundings, together with a review of probable future developments of traffic and adjacent property, are necessary in determining the convenience and safety factors of any individual project.

Changes in circumstances must also enter into consideration. When the railway was built a surface line was probably reasonable and any other arrangement may have been impracticable on the score of cost. But as the city grows, its streets are built up, industries are established, and both street and railway traffic increase until the crossings become objectionable and hazardous. Not only is regular street traffic obstructed, but fire department service may be hampered seriously, while accidents are not only costly but will result in public ill-feeling that cannot wisely be ignored. Under such radically changed conditions the railroad cannot claim a right to maintain its surface line permanently. On the other hand the railroad is not responsible for the city's development and increase of traffic, so that the municipality has not the right to load the entire cost of grade separation upon the railways, although this has been attempted in some cases. Co-operation, compromise and due regard for the rights on each side are necessary for satisfactory solution of problems of this kind.

Topography as a Factor

Local topographic conditions must enter into each problem. In some cases, notably Chicago, a network of lines is spread over flat country, so that track elevation is the evident method of separation. There, however, the question of grade separation for intersecting lines is involved; while at Indianapolis, where all the railways converge upon the Union Railroad, no such problem is involved, and grade separation by track elevation was a comparatively simple project. In other cases, as at St. Louis and Cincinnati, the railways are grouped logically in valleys or along river frontage, so that it is comparatively easy to carry streets over them on bridges. But while this may benefit property on the upper part of the hillside, it may be detrimental to that on the lower slope, where the original street is abandoned or disused.

Detriment to low-level property is also an objection to general use of street viaducts over tracks in level ground, although such viaducts are satisfactory in many individual cases. The most difficult conditions occur in hilly or rolling ground, where both track elevation and depression and extensive street changes may be required. Such difficulties may be magnified if the railroad is located along a hillside, or, as in the case of the approach to Windsor Station in Montreal, they may be greatly simplified.

Advantages to City and Public

In general, the municipality and its people derive by far the principal gain from grade separation, by reason of permanent elimination of traffic interference and accidents. Besides this there are usually extensive street and other improvements which tend to increase the usefulness and value of neighboring property. A general municipal benefit may accrue from the change, as where grade separation aids the development of a city addition or a residential or industrial section. And as a rule, the city obtains these benefits at relatively small expense. It is true that local objectionable conditions may result in some cases, as where a street is closed or is given severe grades, but of necessity there must be some compromise by give and take in the solution of such problems.

Advantages to Railroads

As a rule, the railroad derives some important advantages from grade separation, although at very high cost. It has greater freedom of train movements; it eliminates expenditures for crossing repair, watching and protection; usually it obtains a better roadbed; operating conditions are improved, and it is freed from attacks on the score of dangers and interruptions at crossings. The runout grades at the ends of the rebuilt line may be unfavorable, but in some exceptional cases the profile of the new line may be a distinct improvement. Thus at Columbus, Ohio, both the Pennsylvania and the Norfolk & Western had to use pusher engines at the yard entrances, whereas with the new grades of the track-elevation work the road engines can handle their full trains without assistance.

Again, in probably most cases the railroad takes the opportunity to introduce such improvements as additional tracks or better local yards and freight stations. While these improvements are not essential parts of the grade separation, they could not have been provided on the old location.

Comprehensive Survey Required

For problems of this kind, which usually involve several railroad lines and many streets, the logical and economical method would be to start with a comprehensive survey of the local railway system as a whole and to adopt some basic plan of grade separation. Portions of this plan could then be taken up for negotiation and construction as conditions might require. Logically, such a survey should be made by the city, since each railroad is concerned mainly with its own trackage and facilities, but the co-operation of the railroads would be sought. Unfortunately, this practice is rarely followed. In most cases agitation for grade separation centers on some one line or some part of the city, which is then studied as an individual project. This frequently results in difficulties when later projects have to be considered in relation to those already completed.

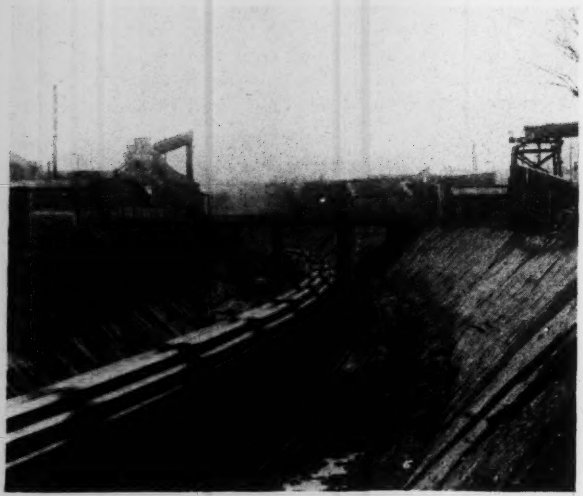
One of the few instances of a comprehensive survey is found at Detroit, although even there no general plan was adopted. But grade separation for the entire city was studied for two years by a special division of the department of public works, which in 1919 recommended a progressive program for a period of fifteen years. The idea was that streets or districts of heaviest traffic would be handled first and the work so distributed that no railway would be burdened unduly in any one year. The estimate was $30,000,000 to $50,000,000, with completion by 1935 or 1940. However, this plan was not adopted by the city authorities, and the work already done has been carried out as a number of individual projects.

Generally, however, each project needs to be studied as a unit by the city's engineers, even if it is part of a comprehensive scheme. It must be worked out in cooperation with the railroads and industries affected, not only as to the design but also as to methods of construction, with a view to safety of adjacent structures and minimizing the temporary closure of streets or tracks. Estimates of cost must be made separately for work to be done at the expense of the city and the railway, and of any electric railway or other utility that may be involved. Included in these studies will be traffic counts and surveys of local conditions, as already outlined.

Track Elevation or Depression?

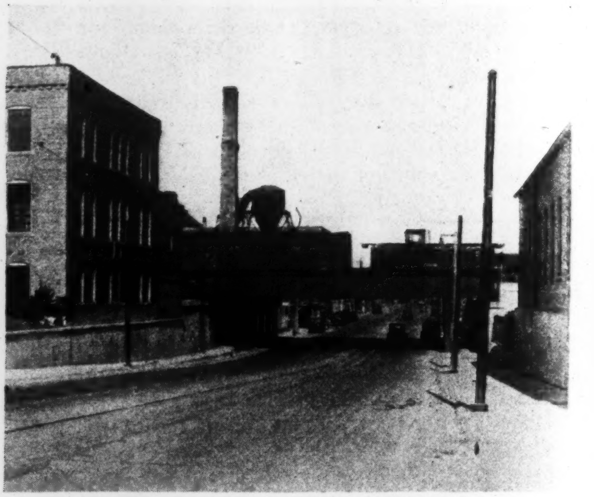
Whether the railway shall be placed above or below the street level is largely a matter of local conditions and topography, but track elevation is by far the more general procedure. In some cases track depression is logical, but where it is advocated by municipal authorities on the score of avoiding the obstructive appearance of an elevated structure or bank the railroad is likely to object on the ground of convenience and cost or on that of difficulty of proper drainage. Track depression may require a cut of 22 to 26 ft. for 17- to 21-ft. headroom under street bridges, while track elevation may require a fill of only 16 to 18 ft., as street subways usually need only 12- to 14-ft. headroom.

Whichever method is adopted, there is usually some compromise to relieve the railroad from full elevation or depression by lowering the street level at subways or



Track depression at Milwaukee, C., M., St. P. & P. Railway

Cut, with retaining walls not yet built. Temporary bridge carries Lisbon Ave.



Milwaukee track elevation, C., M., St. P. & P. Railway

Street depressed to reduce amount of track elevation. Original street grade at left. Bridge with curb-line supports gives clear roadway span.

raising it at bridges over the tracks. Such street changes are less serious in these days of mechanical traction, but the approach grades should not be severe, and the change in level should not be so great as to affect access to abutting property and thus involve damage charges. An example of combined track elevation and street depression is shown herewith. At deep subways expense may be saved by lowering the sidewalks only sufficiently to give a headroom of about 9 ft. Any great depth of street lowering is likely to necessitate reconstruction of sewers, water mains and other public utilities. But even greater interference of this kind may be involved in a long cut for track depression.

Occasionally a street is closed, lateral connections being made to adjacent parallel streets. Frequently street closing may be necessary at the runout inclines where the railroad returns to ground level, but in such case a pedestrian subway is sometimes practicable. However, there is always public opposition to the closing of streets.

Types of Construction

On a narrow right-of-way and in closely built-up districts the railroad cut or fill usually has retaining walls of full height on the property lines, an arrangement which sometimes involves difficulties in footing design. In outlying districts there may be slopes to low walls, according to the width of roadbed and right-of-way. Strong objection is sometimes made to a long fill forming a dividing line or "Chinese wall" through a community. At St. Louis this was an argument which in one case resulted in track depression. In Chicago such an objection was so strong as to lead the Pennsylvania Railroad to abandon a project for a west-side freight terminal, which was to be reached by a long fill running north and south.

In exceptional cases railway viaducts have been built to avoid objections to fills or to meet special conditions. Examples of such construction are the Burlington line through Aurora, Ill., shown herewith, the Pennsylvania railroad crossing of the state fair grounds at Columbus, Ohio, and the Reading railroad at Manayunk, Pa. In the first two cases the viaducts are of concrete with flat decks supported by columns, but the Reading railroad has used a steel viaduct with concrete on the solid deck. All these viaducts carry ballasted tracks.

Through-girder steel bridges for tracks are used sometimes in order to minimize the depth between rail level and the street clearance line, but a deck structure is more desirable as it permits shifting of tracks and eliminates inter-track girders as dangers to employees on the track or the trains. Such deck structures may be built of steel or concrete. As a rule it is important to keep the distance between street and rail level as small as possible, so that shallow floor construction is a primary consideration. Where the railroad is at a considerable height above the street there is greater freedom in bridge design, and in some such cases concrete arches have been built to span the full width of roadway and sidewalks.

A point in street subway design which has been discussed extensively is that of placing a bridge support in the middle of a street. There seems to be little objection to this arrangement where each roadway is of adequate width for two lanes of traffic, and it has the great advantage of materially reducing the span and cost of the bridge. The American Railway Engineering Association recommends a minimum roadway width of 20 ft. for such cases. If a through bridge is required, there is little to be gained by halving the span, but such halving may permit the use of some less costly type of structure. Columns at curb lines may support a clear span over the roadway, but a more common arrangement is to place supports at the curbs and in the middle of the roadway.

Street bridges over tracks now are frequently of reinforced concrete, and if steel is used it should be thoroughly incased with concrete. In any case the spans should be protected from engine blast by cast-iron plates or other shields over each track. A deflector outside the parapet and at deck level is desirable also to prevent smoke and cinders from blowing directly up over the parapet.

All the structures should be of reasonably pleasing appearance, but this is specially important in residence districts and parks and at stations. Two contrasting methods are to be seen at Columbus, Ohio, where the Norfolk & Western uses steel-girder spans masked by concrete facia girders harmonizing with abutments of architectural design, while the Pennsylvania has bold concrete arches. An exposed steel-girder span is not necessarily unsightly, but the general appearance of the structure may be improved by some elaboration of its masonry abutments. With concrete bridges such treatment can be provided at little expense by panels, grooves or belt lines. But special care must be taken with waterproofing and surface finish of concrete, in order to prevent streaking and discoloration. Exposed surfaces are sometimes rubbed smooth, coated with a waterproofing solution and then finished by rubbing or grinding. For cuts and fills the slopes should be dressed smooth and then turfed or planted. At Columbus, Ohio, the park department maintains shrubbery and flower beds on track elevation fills through the parks.

Need of Maintenance

Grade separation structures too frequently are neglected. Concrete cracked and discolored, steel in great need of paint, rough earth slopes littered with rubbish, and subways dark, damp, dripping and dirty cannot fail to arouse public criticism. Street cleaning, repair and drainage are the city's charge, while lighting may be in the hands of either the city or the railway; but the railway is responsible for maintaining a watertight deck and preventing seepage and dirt at the abutments. In some cases of complaint it has been difficult to find what official was responsible for maintenance and inspection.

Railways Along Streets

In several cities during the early days of railroad development railways were built along the middle of a street, for reasons of convenience or cost. As the cities grew, this situation became highly objectionable both in regard to street traffic, safety and property values and for the railway's own traffic and its inability to expand its facilities. In most such instances relocation appears to be the only remedy, but it presented a difficult problem, requiring protracted studies and negotiations before a mutually satisfactory solution could be reached.

At Syracuse, N. Y., for example, a long controversy only recently ended in a plan for removing the New York Central from a main street to an elevated structure on the right-of-way of the West Shore Railroad (a part of the New York Central system), which passes outside the central section of the city. Where the Pennsylvania lines ran along the streets of surburban towns near Pittsburgh there was need for additional tracks and facilities, but the local authorities were demanding removal of the existing tracks. After a cooperative study the authorities aided the railroad in securing new and adequate right-of-way around the towns. In exceptional cases the tracks have been removed to viaducts on the original location, as at Manayunk, Pa., and Aurora, Ill., already noted.

Where two railways are parallel and close together it may be possible to handle the negotiations and construction as a unit. If only one of the lines is elevated, an awkward arrangement of street grades may result, as where Clark St., Chicago, rises to cross the Chicago & Western Indiana and immediately drops on a steep grade to pass under the elevated St. Charles Air Line.

When railroads intersect at grade it is not always practicable to separate them, though the track crossing may be removed from the street level. However, complete separation may be carried out by a three-level arrangement. At Chicago 79th St. is spanned by the Chicago & Western Indiana and above this by the Rock Island; at another point the same street is spanned by the Illinois Central, above which is the New York, Chicago & St. Louis. In each case the two lines cross each other diagonally. Also, where Canal St. is raised to span the Burlington tracks, it is crossed by two high-level railway viaducts.

Industry Connections

Track connections to industries are often troublesome factors in grade-separation problems. If the spur tracks are kept at the old level, steep approaches may be necessary to keep clear of intersecting streets, while putting the tracks at the new grade may involve inconvenient or expensive changes in the plants served. Further trouble arises where tracks extend across streets to industries not directly adjacent to the railway right-of-way. If track elevation would necessitate a bridge, there may be controversy in apportioning its cost, or the city may decline to permit its construction. This difficulty is complicated by the fact that cities frequently grant to industries special privileges for tracks across streets. Although such permits are usually revocable, the holders are likely to regard them as permanent rights, entitling them to damages in cases of change.

Advance discussion of all proposed changes of this kind with responsible officers of the industry concerned often will smooth out difficulties and avoid litigation. It may be made evident that the change will be of such benefit to the community that the industry must accept certain conditions of inconvenience (which may be only temporary) and of cost. In fact, it may be that the change will actually benefit the industry.

Apportionment of cost of grade separation varies widely according to state laws, state commission rules

Railway viaduct through Aurora, Ill., C., B. & Q. Railroad

Tracks were formerly laid partly along the streets. Viaduct considered preferable to solid fill with bridges.

and local ordinances, but usually the railway pays a large proportion of the cost and the city a small or even nominal share. As examples, the Ohio law assigns 65 and 35 per cent to the railway and city, respectively, on the basis of existing facilities. If the railroad desires to increase its tracks or make other improvements it bears the additional cost. In Wisconsin the railroad commission at one time assigned 70, 25 and 5 per cent to the railway, city and street railway, but more recently the proportions vary in each project according to the respective benefits, the city sometimes being assigned as much as 50 per cent of the cost. For the Syracuse project noted previously, the state public service commission assigned 50 per cent to the railroad, 49 per cent to the state and 1 per cent to the county, the city paying no part unless it requires certain works which are not essential for the elimination of grade crossings.

Property damages, as a rule, are assumed by the city. At St. Louis progress was delayed for several years because the city would not assume any share of the expense and the railroads reasonably declined to pay both construction costs and property damages. As a result, a state law was passed transferring from the city to a state commission the power to order grade separation. This commission in some cases assigned 67 per cent of the cost to the railroad and 53 per cent to the city. In Chicago practically the entire construction cost is paid by the railroads, which is manifestly unfair. However, for track elevation in an outlying district subways were specified only for certain streets, the ordinance providing that when others were ordered they should be built by the railroad but paid for by the city.

Conclusion

From the above review it is evident that grade separation is a large and complicated problem. To the railroads it is specially serious, since any one road may have along its lines a number of such projects, the aggregate cost of which is enormous and probably out of proportion to the benefits secured. Since the city realizes so large a proportion of the benefits it should be willing to pay a fair share of the expense, while the attitude of the authorities should be cooperative instead of arbitrary. In each case the cost should be apportioned equitably between the railroad and the city as the main parties, with a due share to other public or private interests involved, such as street railways, industry concerns and state or other public bodies. In such apportionment it must be recognized that the work constitutes a public benefit and is not simply a railroad improvement.

* * *

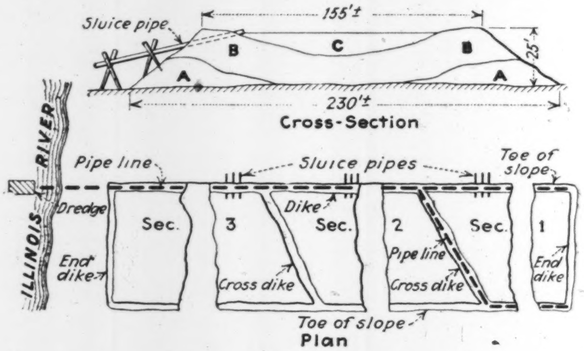
County Supervises Termite Control

Because inadequate methods and poor materials were being used for the treatment of termites in buildings, and because there were many engaged in this type of work who had insufficient knowledge, the agricultural commissioners of Los Angeles County, Calif., were given authority in August, 1929, through a change in the state pest-control laws, to limit this kind of work to persons holding certificates issued by the commissioners. Applicants for certificates are required to pass both an oral and a written examination in order to qualify. All termite control work is reported to the commission's office each month, and a corps of inspectors is used to check up on the quality of the work. During the year 1930 more than $300,000 was expended.

Hydraulic Fill and Dump Fill for High Railroad Embankment

Dredge and motor trucks place base of 65-ft. fill—Dump-car trains on trestles complete fill in two lifts

HYDRAULIC-FILL BASE topped with dry material dumped in two lifts from trestles by both standard-gage and narrow-gage railroad equipment, supplemented by motor trucks and tractors with trailers, was the combination of methods employed in building two long and high embankments for the Atchison, Topeka & Santa Fe Railway system. These embankments are on a diversion or cutoff line about 4½ miles long from Holton to Chillicothe, Ill., and form the approaches to a new double-track high-level bridge over the Illinois River at Chillicothe, Ill., the cutoff being built to enable this bridge to be erected without interfering with the old single-track bridge and swing span. They require 3,500,000 cu.yd. of material, divided about equally on both sides of the river, and about 2,200,000 cu.yd. had been placed by Oct. 1.



Layout of the hydraulic filling work for the base of the embankment

Work was pushed first on the west side, as it was necessary to have track laid to the river by Dec. 1 so that steel erection can proceed while the channel is closed to navigation for the winter. Here the fill is 5,200 ft. long and averages 53 ft. high, with a maximum of 65 ft. This west fill, completed in October, was placed in two lifts. Tractors, crawler wagons and trucks placed 240,000 cu.yd. at the west or shallow end and up to within 34 ft. of the grade line. They were loaded by 1½-yd. dragline excavators and a power shovel. Then trains of narrow-gage cars placed 150,000 cu.yd. by dumping from a trestle. At the east or river end a dredge pumped in about 445,000 cu.yd., making a fill about 25 ft. high. The entire 34-ft. top-lift, requiring 900,000 cu.yd., was placed by standard-gage equipment dumping from a second pile trestle built on the lower lift of the fill. These several stages of the work are shown in the accompanying illustrations.

On the east side of the river the dredge is pumping in 400,000 cu.ft. to make a fill 2,000 ft. long and 20 ft. high, which is extended and brought to grade by standard-gage cars dumping from a trestle. This east fill, with an average height of 53 ft. and a maximum of 63 ft., ~~is to be completed by June, 1931~~.

Structures in these long fills include four double-track bridges of concrete and steel: three over the Rock Island Railroad main line and interchange track and one over U. S. highway 29. There are no culverts.

Hydraulic Fill—The floating electric hydraulic dredge has a centrifugal pump with a capacity of about 8,600 g.p.m., driven by a 600-hp. motor and having a 17-in. intake and 15-in. discharge. Its original 15-in. intake was changed to the larger size on account of excessive vacuum developed. A 14-in. discharge line, usually about 1,000 ft. long, is carried on steel pontoons. When extended to a maximum length of 3,700 ft. a steam booster pump was employed. This dredge has placed 2,500 cu.yd. in a ten-hour day. The material is sand and gravel with a high percentage of shell. It is very abrasive and hard to move in the discharge line, causing considerable difficulty in operating the bottom gates in the pipe. The fill thus made was about 156 ft. wide on top and 230 ft. on the bottom, with sides slopes of 1 on 1½.

To prevent delay in the dry-fill work, it was necessary to place the hydraulic base first in the portion farthest from the river. This was accomplished by building two dikes about 12 ft. high along the toe lines of the slopes, extending from the river to the far end of the hydraulic fill. Cross dikes at the ends and two intermediate points formed three sections 900 to 1,000 ft. long. Then the discharge lines were placed upon these dikes and a second lift was made, while a third move filled the center or pool. A Y-connection was used in the discharge line, so that both dikes were built up at the same time.

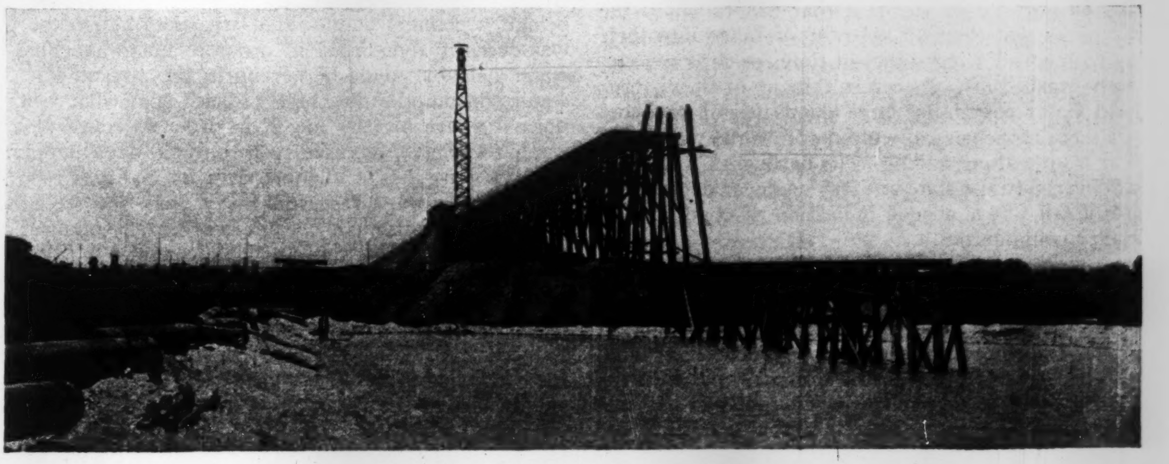
The outside slopes were carried up at 1 on 1½, as specified, and on the inside the material was allowed to take its natural slope, about 1 on 2. From the middle pool the water escaped through sluice pipes buried in the dikes. Gates in the discharge pipes enabled material to be withdrawn at the dikes when the percentage of solids was high, while the water with the lighter sand went into the pool. This method assisted in maintaining the specified slopes, which were controlled also by steel flashboards of No. 14 gage, 18 in. high and 10 ft. long, having a 2-in. T-iron riveted on one edge. As the fill is on swampy land along the river there was considerable subsidence, which was largely made good by the wet fill and thus reduced trouble with settlement of the standard-gage trestle built upon it. This settlement was more severe where the trestle had been built on the original ground.

Dry Fill—The narrow-gage railroad equipment, used only on the west side, was loaded at a pit adjacent to the fill. Material for the standard-gage equipment, used on both sides of the river, was obtained at borrow pits about 3 miles east and west of the river. Most of the material was gravel. Construction trains averaged fifteen cars each, with cars of 12- and 16-cu.yd capacity for the standard-gage equipment and 5-cu.yd. for the narrow-gage. Motor hauling equipment included five tractors, six 7-yd. crawler wagons, three trailers and five 4-yd. trucks. Excavating machinery included six power shovels with 1½- to 3½-yd. buckets and seven dragline machines with 1½-yd. buckets. There was no horse or mule-team work. All the dumping trestles were of pile construction.

Illinois River Bridge

New Bridge—The nine piers, all founded on bedrock, were completed by the end of last year. From the east end the superstructure will consist of a 68½-ft. deck-girder span, two continuous deck-truss spans of 399 ft. and 478 ft., a 440-ft. through-truss channel span with 44-ft. headroom at highwater and 360-ft. channel clearance, a 222½-ft. deck truss and a 68½-ft. deck-girder span. All spans will have ballasted decks. Erection has been started on the channel span, which is to be built while navigation is closed, the bridge to be completed by July, 1931. This cutoff will save 614 ft. in distance and 52½ deg. of curvature, while the sharpest curve will be 1 instead of 7½ deg.

Contractors and Engineers—The general contractor for the grading is the List Construction Co., Kansas City, Mo., which handles most of the work by its own forces, with F. P. Kilty as its superintendent. Three of the bridges were sublet to the Ozark Engineering Co., Joplin, Mo., and the hydraulic-fill work to the LaCrosse Dredging Co., LaCrosse, Wis. For the river bridge the contractors are the Union Bridge & Construction Co., Kansas City, Mo., for the substructure, and the McClintic-Marshall Co., Pitsburgh, Pa., for fabrication and erection of the superstructure. All of this work is under the direction of G. W. Harris, as chief engineer of the Atchison, Topeka & Santa Fe Railway system, and H. W. Wagner, chief engineer of eastern lines.



Three stages of big fill, Santa Fe Railway

In foreground, center pool of hydraulic-fill base, with discharge pipes laid along the side. In center, narrow-gage trestle and first lift of dumped fill, with standard-gage trestle and top lift in rear.

Field Notes on

Water Supply in the Drought Regions

How the Drought of 1930 is affecting community water supplies is reported in field observations by one of the editors of *Engineering News-Record*, the first of which appears below. Drought conditions up to the end of the year were summarized by Dr. F. H. Newell in our issue of Feb. 5. Despite some local rains the drought continues to cause concern among engineers in water-supply service, especially in some of the south-central states, where last summer's rainfall was 50 per cent or less of normal. They find themselves entering the year 1931 with depleted reserves or entirely lacking reserves and with little prospect as yet of a return to normal. —Editor.

Springfield, Ill., Feb. 17

Entering a city on a rainy day, even though the rain is falling lightly, is likely to dull one's zeal for investigating the effects on water supplies of the prevailing drought conditions. But a short time spent at the headquarters of the sanitary engineering division of the state department of health is sufficient for the visitor to be convinced that an inch or so of rainfall at this time will not go very far in building up reserves that have been depleted during many months of precipitation deficiency.

There are fifteen communities in the southern part of Illinois whose public water supplies have been sufficiently depleted to cause their managements either to inaugurate emergency measures or to consider doing so. Representing a total population of 107,000 and an aggregate normal water demand of 9,700,000 gal. per day (9.7 m.g.d.), these communities now have available reserves capable of from 15 to 50 days' supply at the normal rate of consumption. Most of them have taken measures to reduce the consumption rate to conserve what they have. Some have already been forced to put auxiliary supplies into service, to modify their water intakes to make more of their storage available, or to transport water from neighboring towns more fortunately located.

"The farmers in this vicinity were so eager to collect as much as possible of the rain that has fallen in the last day or so that they turned roof drainage into their cisterns without allowing sufficient time for the roof surfaces to be washed off. As a result, many of the cisterns now hold water containing large quantities of soot and dirt. Is there any chemical we can add to the water that will clear it up without adding to its hardness?" So read a note delivered to the state sanitary engineer department during my call. It is a good indication of conditions in the smaller communities.

A Record of Deficient Rainfall

Starting with the month of March, 1930, rainfall records for the state as a whole show a deficiency from normal for each month up to the present time, with the single exception of September, when precipitation was 101 per cent of normal. The total year's rainfall for 1930 was 77 per cent of normal. But figures for the state as a whole are somewhat misleading. There is normally a decrease in the annual average rainfall as one travels southward through Illinois from the Wisconsin border to the southern tip of the state where the Ohio River joins the Mississippi. Because of this variation the southern half of the state really received rainfall totaling less than 70 per cent of the normal expectancy. Conversely, the northern half received more than the 77 per cent state average.

Surface Supplies Affected

Unfortunately, this geographical distribution operates to the disadvantage of the water supplies taken from surface sources, as it is in the southern half of the state that these supplies are concentrated. Most of the supplies in the northern part are obtained from deep wells drilled to porous rock strata which outcrop in Wisconsin. The water from these wells becomes progressively harder toward the south, so that at points south of Springfield it becomes almost too hard to be satisfactory. For this reason surface supplies increase in frequency in the southern counties.

Of the 523 cities and villages in the state having public water supplies, 107 are furnished with water from surface sources, the remainder from wells or springs. Of the 107 with surface supplies, 47 take their water from the Great Lakes or from large rivers like the Mississippi and Ohio. It is in the remaining 60 communities depending on the flow of small streams, with or without assistance from impounded reservoirs, that the effects of the drought have been felt.

Impounded Reservoirs

Impounded reservoirs are in use at 40 of these places, but many of them are of small size. Six of the communities have no dams at all, taking their supplies directly from the streams, and fourteen have small dams built across the stream channels only. With these small dams the only storage available is usually that which can be held in the channel of the stream.

The town of Charleston has such a channel dam across the Embarrass River. Its supply was threatened early last fall. In October the channel of the river was dredged, and the town reported its supply in no immediate danger, in answer to a questionnaire sent out by the state sanitary engineering division on Feb. 3. Charleston has a population of 8,012 and normally uses water at the rate of 1.5 m.g.d.

Carlinville, a village of 4,144 population, on Macoupin Creek, also has no storage except what can be held behind a channel dam. The streambed above the dam was recently dynamited in order to make available the water held by ponds higher up in the streambed. The water consumption has been reduced somewhat from its normal figure of 0.09 m.g.d. in order to conserve what water they have, reported to be only 20 days' supply.

Harrisburg has a channel dam on Saline Creek but has also a storage reservoir away from the streambed, artificially constructed. Water is ordinarily pumped into this reservoir during times of low demand. A full reservoir would contain 220 m.g., but during the long period of low streamflow its contents have been reduced to 40 m.g. Pressure on the distribution system has been reduced from 65 to 40 lb. and has succeeded in reducing the consumption by 40 per cent. The town has 40 days' supply left in the reservoir and is considering the construction of a 7-mile pipe line to Eldorado, which has a plant supplied by wells. Harrisburg has a population of 11,625.

An impounding reservoir on Pyle's Fork supplies water to Carbondale, a junction point of the Illinois

Central Railroad. Although the reservoir when full holds 385 m.g., only 41 m.g. are contained in it now. The railroad has agreed to discontinue watering its freight trains at Carbondale so as to conserve the supply, which was reported to be good for 60 days more. There is a small lake nearby, however, holding 80 m.g., which has not been used heretofore. A half mile of pipe line would serve to make this auxiliary storage available.

Jacksonville ordinarily draws 1.5 m.g.d. from behind an impounding dam on Mauvaisterre Creek. The dry spell, however, has reduced the storage from 628 to only 40 m.g., good for 30 days' supply. A total population of 18,309 is served by the Jacksonville plant. In looking to the future the water-works management is considering transporting water in tank cars from Pearl, a watering point of the Chicago and Alton Railroad, on the Illinois River.

Only fifteen days' supply is left in the reservoir on Sugar Creek supplying Paris. Although the size of the reservoir is such that it can store 75 m.g., collected from a drainage area of 1.7 square miles, the water level has been drawn down so that it now contains but 17 m.g. The town of 8,780 people uses 1.25 m.g.d. under normal conditions, but due to the shortage consumption has been reduced to 0.8 m.g.d. This community is without an auxiliary supply to which it could turn in time of need.

Pinckneyville's reservoir on Beaucoup Creek has been drawn down to hold only 10 m.g. of its total capacity of 200 m.g. That quantity will be good for twenty days more unless the reservoir begins to fill again. Lowering the intake elevation so as to make all of the storage available for draft will give 30 days' additional supply.

The storage on Crooked Creek supplying Salem now holds only 6 m.g. When full, the reservoir contains 173 m.g. The normal draft by the town is 0.46 m.g.d., but it has been reduced to 0.30 m.g.d. The available supply is good for eighteen days.

Effingham, Highland, Litchfield, Marion, Paria, Sparta and West Frankfort are also in similar circumstances, with storage in impounding reservoirs drawn down so as to have available supplies safe for from 30 to 60 days.

In addition, there are three towns, Freeburg, Mount Olive and Mattoon, whose public water supplies are for purposes other than drinking, with reserves badly depleted. Freeburg's reservoir now holds water enough to last only ten days more, and they have been hauling 16,000 gal. per day in tank cars from the Kaskaskia River. Drinking water is supplied to the population of 1,434 by private wells, which have apparently been unaffected.

Deep-Well Supplies

No information has come to the attention of the state department of health indicating failure of any of the deep-well supplies. There has been in all probability a lowering of the water table and increasing pumping heads, but as the condition of such supplies is not readily evident to the plant operators, they are usually not aware of any danger until a well fails entirely. From the increased number of samples sent in for examination, taken from dug wells, the indication is that a number of private shallow wells have failed, and the owners are returning to older wells previously abandoned.

The decreased quantities of flow in streams have had a marked effect on the dilution factors at points of sewage discharge. There is one case on record of a paper mill near Carlysle which discharges sulphite waste into a nearby stream. Although ordinarily aeration in the flowing stream would have effected satisfactory purification within a few miles, under present conditions the stream is completely devoid of dissolved oxygen for 25 miles below the point of discharge, and, of course, aquatic life is entirely absent. The water of the stream in that stretch is black as ink.

A Hands-Off Policy

The policy of the state sanitary engineering division has been, in general, to allow the communities involved in difficulties to work out their own salvation. Only in those places where the plant operator's judgment is felt to be poor is careful supervision exercised over the use of emergency supplies. In all cases chlorination has been used to protect the new supplies, and as a result there has been a complete absence of outbreaks of waterborne disease. —F.W.H.

Sewage Reclamation in Southern California

URGED on by the rapid increase in population, combined with the growing inadequacy of the local water resources, the communities of southern California are engaging in an intensive study of sewage reclamation as an aid to water conservation. With active field experiments under way, the preparation of reports in progress as to the feasibility of several projects and a noticeable decline in sentiment favoring ocean disposal, the trend of engineering and public thought is turning toward the possibility of re-using the present water supplies. Although no major development is under way at this time, preliminary phases of the general subject are receiving active investigation, particularly in the larger metropolitan areas.

The department of water and power in Los Angeles, with $100,000 available, is actively engaged on practical operating experiments in sewage reclamation under the direction of H. A. Van Norman, chief engineer. An experimental plant capable of handling 200,000 gal. of raw sewage per day is in operation and long-time studies have been started to determine the practical utilization of effluent for the replenishment of groundwaters. Investigations will include complete determination of the costs involved.

Long Beach turned down for a second time the proposal to enter the Los Angeles County Sanitation Districts, which subdivisions include the territory outside the city. The plan of the districts for a large ocean outfall shows no evidence of new developments and, it is understood, the directors of the district are becoming interested in the feasibility of a disposal plant for reclamation of sewage as an alternate project.

Several towns in the San Gabriel Valley, including Pasadena, propose to appoint a consulting board to study the sewage problem and report on the feasibility of reclamation in connection with diminishing groundwater supply.

San Diego, which now discharges untreated sewage into the bay, is looking for a more suitable method of disposal because of increasing nuisance at beaches. Several schemes are under consideration which would involve an intercepting trunk on the waterfront to remove the sewage to a proposed treatment plant south of the city. Disposal of the effluent from such a plant could be by outfall into the ocean, with the possible alternative of pumping it inland to be used to replenish groundwater.

ENGINEERING LITERATURE

A Monthly Review of Books and a Listing of New Publications

For Graduate Students and Research Engineers

REVIEWED BY C. J. TILDEN
Professor of Engineering Mechanics,
Sheffield Scientific School, Yale University, New Haven, Conn.

MATERIALS AND STRUCTURES: A Text-Book for Engineering Students, Vol. I, The Elasticity and Strength of Materials—By E. H. Salmon, D.Sc. (Eng.), London, M.Inst.C.E. London, New York and Toronto: Longmans, Green & Co. Cloth 6x9 in.: pp. 638; 396 line cuts and halftones. $6.

IT IS gratifying to come across in a technical treatise of this sort such pleasant evidence of an affectionate discipleship. Mr. Salmon has dedicated his book "to David Allan Low, Wh.Sch., M.I.Mech.E., emeritus professor of engineering, East London College, University of London, to whom both book and author owe so much. On referring to his well-worn copy of Low's "Applied Mechanics," the first edition of which appeared more than twenty years ago, the reviewer found that the three chapters on design of structures were written by Mr. Salmon and so credited in the preface. Professor Low's great work, a model of clearness and thoroughness, is widely and favorably known and has seen much use both in this country and in Great Britain. Its design and arrangement bespeak the good teacher, and in the work under review, written by Professor Low's former student and younger colleague, there is added evidence of the inspirational value and guidance of this instruction.

But in thus taking the torch from his old teacher, Mr. Salmon has done his full share in carrying it forward. The 650 pp. of his book give a clear, concise and thoroughly up-to-date presentation of the subject. The arrangement of topics is logical and the language of the text clear and readable. The illustrations are excellent, drawn with a finished clearness and accuracy that is most satisfactory. There are nearly four hundred of these sketches and diagrams scattered through the text.

The preface states that this volume, embracing the elasticity and strength of materials, forms a treatise complete in itself, but is to be followed by Vol. II, "an equally complete work dealing with the theory and design of structures."

The book (Vol. I) is divided into two parts, analytical and empirical. Part I, comprising the first thirteen chapters, covers the fundamental concepts of stress and strain, the theory of beams and bending, including beams with initial curvature (the crane-hook problem) and inclined beams, compression members, shafts and springs There is a chapter on strain energy and resilience, and one on elastic vibrations and critical speeds. One chapter of 65 pp. is devoted to an introduction to the mathematical theory of elasticity which "has been made to conform in a general way with Love's "A Treatise on the Mathematical Theory of Elasticity," the standard book on the subject."

Part II, the last seven chapters, deals with the physical properties of engineering materials. In this volume only the metals, ferrous and non-ferrous, are described, leaving timber, stone, concrete, etc., to the forthcoming Vol. II. The standard tests, both investigative and "acceptance," are described. In a chapter on combined stresses the various theories which have been put forward to explain complex stress distribution (Lamé and Rankine, St. Venant, Coulomb, Mohr and the others) are briefly stated and then discussed in the light of recent experimental evidence. The Mohr stress circle is described in this connection. The strain-energy theory, especially as developed by Professor Haigh some eight or ten years ago, is given due attention. Impact, hardness and fatigue and the effects of high and low temperatures are duly considered. Throughout the book the text is thoroughly documented, an exhaustive bibliography appearing at the end of each chapter.

The treatise is a distinct contribution to the literature of the subject and decidedly advanced in character. For graduate students and engineers dealing with research problems it will be invaluable. In the preface the author says: "It is primarily intended for those taking the B.Sc. (engineering) degree at London, the examination for the associate membership of the Institution of Civil Engineers and other similar examinations; but the book has been planned on no narrow basis and is also intended to form an introduction to the enormous mass of information now available to engineers." It appears to fulfill these functions admirably.

It is doubtful, however, if the book could be used to advantage with undergraduate students in American schools of engineering. Differences in units, while not a vital obstacle ("The value of *E* for plain carbon steels ranges from 12,700 to 13,800 tons per square inch"), may be confusing to the average sophomore or junior, whose attention should be concentrated on much more fundamental concepts. A teacher gifted with drastic and discerning powers of "skipping" might use it, but only for graduate study would it be likely to find its maximum usefulness as a class text. As a work of reference it would be difficult to overestimate its value and importance, and it should have a place in the working library of every one concerned with the problems, theoretical or practical, of engineering materials.

Airports and City Planning

AIRPORTS: Their Location, Administration and Legal Basis—By Henry V. Hubbard, Miller McClintock and Frank B. Williams, Assisted by Paul Mahoney and Howard K. Menhinick. [Harvard City Planning Studies, Vol. I.] Cambridge: Harvard University Press. London: Humphrey Milford. Cloth 7x10 in.; pp. 190; halftones, tables and line cuts. $3.50.

THE first published result of the research work that the Harvard Graduate School of City Planning was organized to undertake performs a most useful purpose in collecting, and to some extent collating, the scattered data on airport location and administration. The book is divided into three parts—location, administration and legal aspects—each designed to assist all those having to make decisions on airport matters by pointing out the important factors, suggesting the usual or best relationship of the factors and their relative importance. The book is intended for city officials, city plan engineers and airport officials. Many data for it were secured first hand by one of the authors. Maps of many ports are included. Data on widths and lengths of runways, areas of ports, organization setups, costs, etc., are given. The book represents the most complete and studied attempt yet made to chart a course in airport planning.

Woods and Their Industrial Uses

WOOD, LUMBER AND TIMBERS—By Philip A. Hayward, B.S. in Forestry, M.S. in Wood Technology, Technical Consultant U.S. Department of Commerce. Vol. 1 of Chandler Cyclopedia for the Scientific Selection, Purchase and Use of Commodities. New York: Chandler Cyclopedia, 55 West 42d St. Cloth; 8x11 in.; pp. xxvii + 521; line cuts, halftones and maps showing, geographical range of the various species of timber covered. $10.

THERE has been chosen for the opening volume of a unique cyclopedia on various important commodities one of the most widely used and most useful materials of the construction and many other industries—*Wood.*

The present volume opens with a section on physical and mechanical properties of wood. Lumber, its manufacture and distribution, is taken up next. Both these sections are quite detailed. A brief section on the identification of wood is followed by classified lists of the industrial uses of wood, each use being followed by the kinds of wood, both soft and hard, employed. The remainder of the body of the volume is devoted to the commercially important trees of the United States, introduced by notes on the various species, and followed by 29 hardwoods and 15 softwoods, the habitat of each shown by maps. The general plan here is to give annual production and its unit value at the mill in 1928, the timber stand existing at the latest dates for which figures are available, principle states of production, range of species, usual and various local names, and much other information, including uses, names of standard specifications, engineering data, associations and periodicals concerned and reference books. Many useful tables are given at the end of the volume. There is a detailed index.

Although somewhat similar data on the various trees of the United States have appeared in earlier books, this volume seems to go farther than the others as to species and their uses, while in addition it contains much other information, making it altogether the most complete compendium on woods and their uses that has come to our attention.

The Well-Point Method

GRUNDWASSERABSENKUNG BEI FUNDIERUNGSARBEITEN —Von Dr.-Ing. Wilhelm Kyrieleis. In Zweiter Auflage neubearbeitet von Dr.-Ing. Willy Sichardt. Berlin: Julius Springer. Paper; 6x10 in.; pp. 286; 152 line cuts and halftones. 21 marks in paper; 22½ marks bound.

SINCE the appearance in 1914 of the German book by Dr. Kyrieleis on the theory and practice of the well-point method of foundation dewatering there has been a noteworthy advance in the art. In revising the original text, Dr. Sichardt has found it necessary to increase the length of the treatise by nearly a hundred pages.

Although the theory of groundwater flow dates from the original contribution of Darcy, amplified by Dupuit, Thiem and Forcheimer and applied by them to the problems of well hydraulics, there have recently appeared valuable additions of an empirical nature, principally in regard to the indeterminate factors in the theoretical equations. Chief among these indeterminate factors has been the radius of influence of a single well. Included in this new edition is a thorough treatment of the work of Schultze and Weber in correlating this troublesome factor with the known conditions of the problem under consideration. Further, the development of the mathematical relations between the lowering of the groundwater level and the operation of a number of wells has been done in such a way that the engineer of today can now proceed with a high degree of confidence in the design of a system of wells and pumps to keep his foundation excavations dry. That confidence will be greatly strengthened by a study of the numerous examples cited by Dr. Sichardt where the system was used. He gives the original data of each problem, the design of the well-point system to achieve the desired result and, most important, a comparison of the actual results attained with that predicted in design. Very striking indeed are the examples given of the use of the method in excavations in open water.

Perhaps the most interesting development in this construction expedient is that connected with relatively large degrees of groundwater lowering. With the well casing serving as a suction well for a centrifugal pump placed on the surface the degree of lowering possible is sharply limited by considerations of suction lift. To attain greater lowering, excavation in stages has been adopted whereby the installation of pumping machinery at progressively lower elevations is made possible by the operation of a system of wells at a higher level. But considerations of cost favor the use of as few wells as possible. Deep-well pumps with long vertical shafts have been in use for some time in water supply practice, but, according to Dr. Sichardt, their use has not proved satisfactory with the temporary and often crooked wells used for construction purposes. Through the enterprise of some of the European machinery manufacturers pumping equipment has now been developed which avoids this disadvantage. Pumping units in which pump and motor together are lowered into the well and operate submerged are proving successful. The unit is inclosed in a cylindrical steel shell and the motor chamber is protected from the seepage through the stuffing boxes by compressed air introduced from above.

Although the focus of the book is on the use of wells as a construction expedient, the water-works engineer can find in it material of much value. Surely in no American text on water supply is there such a thorough treatment of the hydraulics of wells.

Painting Concrete

THE PROTECTION AND DECORATION OF CONCRETE—By Maximilian Toch, D.Sc., Vice-President and Chief Chemist of Toch Brothers, Inc., and the Standard Varnish Works, New York. New York: D. Van Nostrand Co. Cloth; 5x8 in.; pp. 49. $2.

BECAUSE of the prominence of the author in the field of decorative concrete this small guidebook may be regarded as authoritative. It lists the proper and improper chemicals available for neutralizing lime in concrete, thus making it suitable for taking paint. The safe and unsafe pigments are also listed. Atmospheric damage to paint (particularly from sulphuric acid and coal smoke) and the author's opinion that city air contains much injurious metallic iron are treated at some length.

Facts for Use and Food for Thought

POPULATION—[Lectures on the Harris Foundation, 1929.] By Corrado Gini, President of the Central Statistical Bureau, Rome, Italy; Shiroshi Nasu, Professor of Rural Economics, Imperial University of Tokyo, Japan; Robert R. Kuczynski, Council Member, Institute of Economics, Washington, D. C.; Oliver E. Baker, Economic Geographer, Bureau of Agricultural Economics, Department of Agriculture, Washington, D. C. Chicago: University of Chicago Press. Cloth; 5x8 in.; pp. 312; tables and many line cuts. $3.

POPULATION PROBLEMS—By Warren S. Thompson, Director of Scripps Foundation for Research in Population Problems, Miami University. New York and London: McGraw-Hill Book Co. 6x9 in.; pp. 462; graphs and tables. $3.75.

SELDOM do two books provide more facts for use and more food for thought than "Population" and "Population Problems." The first contains addresses by four authorities from as many countries on four broad phases of its subject. The second is a unified comprehensive review of the whole field by a single specialist. Both are problem studies, elucidated by statistics of trends of population changes, in numbers and composition, and by food-supply and other statistics related to the main topic. Each deals with problems underlying much of the planning and forecasting which falls to the engineer, the production and distribution manager and the capitalist concerned with the growth of countries and cities and their demands for goods and services. Both books are significant as showing great natural and other forces profoundly affecting future populations and their needs.

In "Population", the cyclical rise and fall of population is dealt with by an Italian, who believes that nations are born, flourish and decline—and sometimes revive. A Japanese takes up population and the food supply, with consideration of living standards, problems of the East and West and whether Japan can solve the population problem. An American comes on the stage for the third act, discussing the trend of agricultural production in North America, in its relation to Europe and Asia. Finally, the former director of the municipal statistical office at Berlin-Schoenberg discusses the world's future population, starting with the assumption that it is somewhere near two billion and concluding that, under present conditions, it will take 150 years and possibly much more for it to double. In general, all four writers are optimists.

Professor Thompson's "Population Problems" is wide ranging and thorough going. After a brief preview, the author outlines the Malthusian theory of population, both in its original and in its later considerably modified and less pessimistic form, with less and less strict adherence to the dictum that population increases geometrically while subsistence grows arithmetically, with an unfortunate reaction on mankind.

Among the many other topics of this comprehensive book are: composition of population; birth and death rates and their decline; effects of famine and disease; future growth of population in the United States; agriculture, industry and commerce in relation to population; several chapters on city populations, including a significant one on the future of the large city; the differential population (social composition, etc.) and international politics; and possibilities of controlling population growth. There is a bibliography with 332 entries and a serviceable index.

Present-Day Estimating

ESTIMATING BUILDING COSTS—By Charles S. Dingma Architectural Engineer. Second Edition. New York and London: McGraw-Hill Book Co. Flexible; 4x7 in.; pp. 277; tabl and line cuts. $2.50.

THE procedure of estimating construction costs has changed to keep pace with new developments in the field of construction. A complete motorization of all haulage, increasing use of power shovels and other types of excavating machinery, use of portable saws, drills and other small tools, and the widespread adoption of the water-cement ratio in concrete proportioning are some of the recent developments in building construction that make changes in estimating processes necessary. Mr. Dingman has sensed these changes occurring since the publication of his first edition of "Estimating Building Costs" and has revised his work accordingly. The use of man-hours and machine-hours as a basis for estimating costs has been retained. The tables are [illegible] arranged that full use can be made of mechanical calculating machines in preparing estimates. Chapters added to the second edition include interior marble, tile and terrazzo work, foundation and cement-gun work. The author has produced a compact treatise on estimating.

Kennedy Hydraulic Diagrams Reprinted

HYDRAULIC DIAGRAMS FOR CHANNELS IN EARTH, Giving Discharges, Mean Velocities, and Silting Data for Varying Bed Widths, Depths and Slopes: Based on Ganguillet & Kutter's Formula—By [late] R. G. Kennedy [onetime] Chief Engineer, Punjab Irrigation Branch, P.W.D., India. Issued for the Use of the Public Works Department, India. Second Edition. Reprinted for sale by M. C. (Mrs. R. G.) Kennedy, 182 Kew Road, Richmond, Surrey, England. Flexible binding; oblong, 19x12 in.; 12 pp. of four-column text, with one diagram; also 13 diagrams lithographed in three colors, of which 8 are 17½x9½ in. 17½s. in England; postage extra.

LONG out of print, these diagrams, which have been used for 35 years for designing irrigation canals in the Punjab, are again available. The text is in two parts: (1) a short paper (No. 2826, Session 1894-95) read before the Institution of Civil Engineers, (2) an introduction, written in 1907 to go with a second and much revised set of the diagrams redrawn for $n = 0.0225$ in place of the original 0.025, the former apparently having been for a time the official standard on Punjab work. The diagrams cover slopes of from 1 to 10,000 to 20,000 and capacities up to 10,000 and 400 "cusecs" (feet per second). The "Kennedy silt theory" is presented in the text.

Stadia Surveying Abroad

MESURE OPTIQUE DES DISTANCES et Méthode des Coordonnées Polaires avec Etude Spéciale du Tachéomètre Auto-Réducteur Bosshardt-Zeiss—Par Rodolphe Bosshardt, Géomètre du Registre Foncier à St.-Gall (Suisse). Geneva: Georg & Cie. Libraires-Editeurs, Libraires De L'Université. Cloth; 6x9 in.; pp. 172; line cuts and tables. 10 Swiss francs.

OPTICAL methods of measuring distances have attained considerable accuracy in Europe, chiefly because of the development of precision instruments for this purpose. A number of the better known type of such instruments are described in the French volume listed above. This task having been accomplished, the author proceeds to outline the methods used in surveying by the system of polar coordinates, as contrasted with the common use of rectangular coordinates. Other chapters discuss sources of error, survey organization, and the selection of instruments. Appendices include a bibliography and tables for the reduction of inclined to horizontal distances.

Publications Received

MORE THAN 1,600 research laboratories are listed, their staff and their lines of work given, in the fourth edition of *Industrial Research Laboratories of the United States*, compiled by Clarence J. West and Callie Hull. (Paper, pp. 267. $2 from National Research Council, Washington, D. C.)

ADDITION OF TWENTY CITIES to the council-manager list in 1930 brought to 425 the total number of adoptions, including fourteen in Canada and three in Ireland. A list and map of manager cities, together with a review of the growth of the plan, are given in *Public Management* for January (50c. from International City Managers' Association, 923 East 60th St., Chicago). The issue also contains fifteen articles by various authors under the general head *Municipal Administration in the Making*.

A DAM to regulate the Primera River, in the Argentine, has been recommended by a board of engineers consisting of Rodolfo E. Ballister, Adolfo Surez and Carlo A. Volpi. The dam would be 43 meters high and would be located just below an existing dam at San Roque. Besides adding to the present supply of water for irrigation the dam would provide power for the use of Cordoba. The report (written in Spanish, 125 pp. quarto, with folding plates) is entitled *Digne San Roque* and is addressed to the provincial minister of public works, Cordoba, Argentine.

A JOURNAL OF ENGINEERING RESEARCH has just made its appearance in Germany, under the title *Forschung auf dem Gebiete des Ingenieurwesens*. It is issued by the VDI-Verlag, Berlin. It is the successor to the paper *Technische Mechanik und Thermodynamik*, which first appeared a year ago. The January issue contains articles on measurements on rotating objects, the thermal properties of ammonia compounds and their use in absorption refrigerating machines, hydrodynamic research, furnace temperature regulation, investigation on knocking in internal combustion engines, and tests on flow meters for gases.

THE POPULATION COUNT of the Fifteenth Census of the United States is now available in *First Series Bulletins* for each state and also in a *United States Summary*. Each state bulletin gives, among other figures, the population of every minor civil division for 1930, 1920 and 1910, with a separate list of population of incorporated places, 1930 and 1920. The summary for the whole country gives populations by states and counties, urban and rural areas, and for incorporated places of 1,000 and over, the latter arranged by population groups. (15c. for U. S. Summary; 10c. each for Georgia, Missouri, New York, Ohio, Pennsylvania and Texas; 5c. each for other states and for Alaska, etc.)

A TRIBUTE to George Washington as an engineer is given by President Hoover in his foreword to the first volume of the *Writings of George Washington*, about to be published by the authority of Congress. Mr. Hoover says: "A much-neglected side of his character is Washington as an engineer. His countrymen have not realized how modern he was in his engineering operations—as reclaimer of the Dismal Swamp; as adviser and engineer of the Potomac and James River Canal; as the first advocate of a combined highway and waterway from the Atlantic Coast to the Ohio River; as a bank director; as an investor; as one of the earliest Americans to recognize the possibilities of power transportation by water, and the first to suggest that air navigation might be very useful to the people of the United States."

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New Books and Revised Editions

[*Those desiring copies of the books listed below or mentioned elsewhere in this section should order them from the publishers or from their local booksellers.*]

BERICHTE DES AUSSCHUSSES FUR VERSUCHE IM STAHLBAU: Heft 4, Versuche zur Ermittlung der Knickspannungen für verschiedene Baustähle—Von W. Rein, O. Professor an der Technischen Hochschule Breslau. Berlin: Julius Springer. Stiff Paper; 8x11 in.; pp. 55; tables illustrated. 6 marks in Germany.

BUILDING AND LOAN ANNALS, 1930—Chicago: U. S. Building & Loan League. Cloth; 6x9 in.; pp. 751; $10.

Within the covers of this huge volume—a new venture of an old association—are many addresses before state and group conventions, the proceedings of the national league at its 42d convention, and a directory of the league, of various sectional organizations, and of state associations.

THE CALIFORNIA JOINT FEDERAL-STATE WATER RESOURCES COMMISSION: Report to the President of the United States and the Governor of the State of California. Paper; 6x9 in.; pp. 28. For copies address the Governor of California, Sacramento.

Recommends large storage reservoir on Sacramento River for benefit of navigation and irrigation, to provide flood control and to maintain fresh water in the delta for benefit of industries on Suisun Bay, at a total cost of $135,000,000, both state and federal aid; also approves in general terms bringing water from Colorado River for benefit of southern California.

COLORADO RIVER AQUEDUCT LOCATION: Final Report of the Engineering Board of Review to the Board of Directors of the Metropolitan Water District of Southern California—By Thaddeus Merriman, Richard R. Lyman and A. J. Wiley. Paper; 9x11 in.; pp. 45; folding map. For copies apply to Secretary, Metropolitan Water District, Los Angeles, California.

Gives reasons for approving Parker route and for not approving the three other routes which the commission chose for further study after considering dozens of routes that had been surveyed by engineers acting for Los Angeles and later for the water district. See *Engineering News-Record*, Dec. 25, 1930, p. 1024, and for earlier and more detailed report see illustrated article, *Engineering News-Record*, Nov. 27, 1930, p. 854.

THE COLUMN ANALOGY: Analysis of Elastic Arches and Frames by the General Formula for Flexure—By Hardy Cross, Professor of Structural Engineering. Urbana: University of Illinois. Paper; 6x9 in.; pp. 78; many illustrations. 40c.

Shows "that bending moments in arches, haunched beams and framed bents may be computed by a procedure analogous to the computation of fiber stresses in short columns subject to bending, and that slopes and deflections in these structures may be computed as shears and bending moments, respectively, on longitudinal sections through such columns. . . . restricted to geometrical relations."

THE COMING OF INDUSTRY TO THE SOUTH—Edited by William J. Carson, Ph.D. Philadelphia: American Academy of Political and Social Science. London, England: P. S. King & Son. Cloth; 6x9 in.; pp. 296; tables and illustrations. $2.

Twenty-seven papers by various authors, among which are: "Iron and Steel Industry," by Edwin C. Eckel, C.E.; "Power Situation in the Southern Power Province," by Thorndike Saville; "Negroes in Southern Industry," by T. Arnold Hill; "Transportation Developments and Economic and Industrial Changes," by Roland B. Eutsler, Ph.D.

THE CONCRETE YEAR BOOK 1931: A Handbook, Directory and Catalogue of Concrete—Edited by Oscar Faber, O.B.E., D.Sc., M.Inst.C.E.; and H. L. Childe, Editor, Concrete Publications, Ltd. London: Concrete Publications, Ltd. Cloth 6x9 in.; pp. 708; halftones and line cuts. Postpaid, 4½s.

To the handbook sections new chapters on bridges and on joints in concrete work have been added, the former "dealing with design according to the requirements of the Ministry of Transport." The directory section is a classified list of British manufacturers and dealers and is supplemented by a catalog section (advertisements) of nearly 400 pp.

ELECTRIC POWER AND LIGHT COMPANIES of the United States: The Bonbright Survey. Seventh Edition, Revised to September, 1930. Arranged [by States] According to Geographic Divisions. Edited by G. F. Wittig, Statistical Editor, *Electrical World*. New York: McGraw-Hill Publishing Co., Inc. Stiff paper; 8x11 in.; pp. 195; maps and tables. $10.

By means of symbols in tables and on maps this annual shows the central electric station service afforded to places of 2,500 population and upward. The information for each place includes population in 1930 (so far as available at the date of compilation) and in 1920, and ownership, private or public. Capitalization and earning of companies, also by states, are given. A more detailed notice (sixth edition) appeared in these columns April 17, 1930, p. 663. The summaries noted as desirable in that review are still lacking.

ESTIMATING BUILDING COSTS—By Charles F. Dingman, Architectural Engineer. Second Edition. New York and London: McGraw-Hill Book Co. Flexible; 4x7 in.; pp. 277; tables and line cuts. $2.50.

Noticed on p. 370 of this issue.

FINANCIAL STATISTICS OF STATES, 1928—Compiled by U. S. Bureau of the Census. Washington, D. C.: Superintendent of Documents. Paper; 6x9 in.; pp. 121; tables and graphs. 20c.

GROUNDWATER of Middle Rio Grande Valley and Its Relation to Drainage—By Dean W. Bloodgood, Associate Irrigation Engineer, U. S. Department of Agriculture, New Mexico College of Agriculture and Mechanic Arts, State College, N. M. Paper; 6x9 in.; pp. 60; halftones, maps and line drawings.

HOOVER-YOUNG SAN FRANCISCO BRIDGE COMMISSION: Report to the President of the United States and the Governor of the State of California, August, 1930. Paper; 6x9 in.; pp. 234; folding maps and drawings. For copies apply to the Governor of California, Secramento.

Recommends location of bridge from San Francisco to Oakland, via Goat Island, See *Engineering News-Record*, July 31, 1930, p. 191.

HOW TO JUDGE A HOUSE—By Nelson S. Perkins, C.E., Construction Engineer, National Committee on Wood Utilization (Under auspices of U. S. Department of Commerce). Paper; 6x9 in.; pp. 85; halftones, tables and line drawings. 10c. from Superintendent of Documents, Washington, D. C.

MECHANICAL WORLD YEAR BOOK, 1931—Manchester, England: Emmott & Co. Cloth; 4x6 in.; pp. 176; tables and line cuts.

MOTOR ROADS IN AFRICA (Except Union of South Africa)—Trade Information Bulletin No. 733, U. S. Compiled by Irving Freidson, Automotive Division, Bureau of Foreign and Domestic Commerce. Washington, D. C.: Superintendent of Documents. Paper; 6x9 in.; pp. 47; tables. 10c.

MUNICIPAL EXPENDITURES—By Mabel L. Walker, Ph.D. Baltimore: The Johns Hopkins Press. London: Humphrey Milford, Oxford University Press. Cloth; 6x9 in.; pp. 198; tables and line cuts. $2.25.

PLANE TRIGONOMETRY, With Tables—By William Wilder Burton, Ph.B., A.M. Assistant Professor of Mathematics, Clemson College, S. S. New York: Thomas Y. Crowell Co. Cloth; 6x9 in.; pp. 125; line cuts; together with 93 pp. of five-place logarithmic tables. $2.50.

THE PREPARATION OF ZONING ORDINANCES: A Guide for Municipal Officials and Others in the Arrangement of Provisions in Zoning Regulations—Preliminary Edition. Mimeographed. Free on application to Division of Building and Housing, Bureau of Standards, Washington, D. C. Paper; 8x11 in.; pp. 57.

THE RIGID-FRAME BRIDGE— By Arthur G. Hayden, M.Am. Soc.C.E., Designing Engineer, Westchester County Park Commission. With Chapters on Architectural Development by Gilmore D. Clarke, Fellow, A.S.L.A., and Deformeter Analysis by Prof. George E. Beggs, M.Am.Soc.C.E. New York: John Wiley & Sons. London: Chapman & Hall. Cloth; 6x9 in.; pp. 236; halftones, tables and line cuts. $4.50.

STATE AND LOCAL TAXATION OF PROPERTY—New York: National Industrial Conference Board. 247 Park Ave. Cloth; 6x9 in.; pp. 245. $2.50.

STATE WATER PLAN FOR CALIFORNIA: Bulletin 28-A, Industrial Survey of Upper San Francisco Bay Area, With Special Reference to a Salt Water Barrier Below Confluence of Sacramento and San Joaquin Rivers. 31, Santa Ana River Basin; A Plan for Flood Control and Conservation of Waste Water; Salinity Intrusion. 32, South Coastal Basin, A Cooperative Symposium of Activities and Plans of Public Agencies in Los Angeles, Orange, San Bernardino and Riverside Counties, Leading to Conservation of Local Water Supplies and Management of Underground Reservoirs. Sacramento, Calif.: Division of Water Resources, Edward Hyatt, State Engineer. Paper; 6x9 in.; pp. 72, 73, 79; maps.

STATISTICS OF RAILWAYS IN THE UNITED STATES, 1929: —By Interstate Commerce Commission. Cloth; 9x12 in.; pp. 272; tables and illustrations. $1.30 from Superintendent of Documents, Washington, D. C.

STEEL STRUCTURES RESEARCH—Verbatim Report of a Conference Held Oct. 16, 1930, at the Institution of Civil Engineers. Paper; 7x10 in.; pp. 38. 1s. from H. M. Stationery Office, London W.C. 2; 35c. from British Library of Information, 5 East 45th St., New York City.

STEAM GAGING IN ARKANSAS FROM 1857 TO 1928—By W. S. Frame, Acting District Engineer, 1928-1929, U. S. Geological Survey [In Cooperation with the U. S. Geological Survey.] Little Rock, Ark.; State Geologist. Cloth; 7x10 in.; pp. 141; halftones and tables. $1.90.

STRENGTH OF WELDED SHELF-ANGLE CONNECTIONS—By James H. Edwards, H. L. Whittenmore and A. H. Stang, U. S. Bureau of Standards, Reprint from B. of S. Journal of Research, October, 1930. Paper; 6x9 in.; pp. 22; illustrated. 10c. from Superintendent of Documents, Washington, D. C.

STUDIES ON TWO-STAGE SLUDGE DIGESTION, 1928-29—Illinois State Water Survey, A. M. Buswell, Chief, W. D. Hatfield, Editor. Cloth; 6x9 in.; pp. 92; 27 illustrations. 50c.

Indicate "a relatively small primary tank designed to allow six or eight days' detention and equipped with the necessary circulating devices to prevent scum and foam formation, and a secondary tank or even a lagoon of sufficient size to allow for the necessary ripening of the sludge to a state where it will drain on sand beds." Bulletin also takes up solids, gas, grease and cellulose balances, grease and cellulose digestion, digestion of tank liquor for seeding, and a new method of determining settling solids.

TENSILE STRENGTH OF THREADED STEEL RODS—By R. P. Davis, Assistant Dean, and L. V. Carpenter, Professor of Sanitary Engineering, West Virginia University, Morgantown, W. Va. Paper; 6x9 in.; pp. 12.

TESTS ON ELECTRIC ARC WELDED LAP JOINTS—By R. P. Davis, Assistant Dean, L. V. Carpenter, Professor of Sanitary Engineering, West Virginia University, Morgantown. Paper; 6x9 in.; pp. 16; halftones, tables and line cut.

TRAVAUX PUBLICS—Par E. Aucamus, Ingenieur des Arts et Manufactures; Revise par ph. Rosseau, Secrétaire Génèrale de ter Société Francaise des Ingénieurs Colonniaux. 50th edition. 1931. Paris; Dunod, 92 Rue Bonaparte (VI). Flexible; 4x6 in.; pp. 608; 102 illustrations. 20 francs in Paris; 23½ francs postpaid to foreign countries. Fiftieth issue of a French handbook on highways.

TREATMENT OF WATER FOR ICE MANUFACTURE—By Dana Burke, Jr., Special Research Assistant Professor in Chemical Engineering. Urbana: University of Illinois. Paper; 6x9 in.; pp. 114; many illustrations and tables. 60c.

VERMONT FLOOD CONTROL: Final Report of Advisory Committee of Engineers on Flood Control to Hon. John E. Weeks, Governor [J. W. Votey, Chairman, H. K. Barrows, Consulting Engineer, Harry Barker, Secretary] Montpelier, Vt.: Public Service Commission. Paper; 6x9 in.; pp. 23; folding map and tables.

Includes considerable part of an earlier report dealing with the five larger streams of the state and deals with twelve remaining streams. Consulting Engineer Barrows says that on all seventeen streams such flood damage as was caused in 1927 could be prevented by storage reservoirs, in conjunction with power development. An initial program for each river basin is presented.

LETTERS TO THE EDITOR

Pressure Relief Valves on Pipes

Sir—The non-freezing anti-vacuum valve, which Mr. George I. Uitti desires to find, is described and illustrated in Mr. W. T. Halcrow's paper on the Lochaber water-power scheme, read before the Institution of Civil Engineers, London, on Nov. 18, 1930; also in *Engineering*, Nov. 28, 1930.

Possibly a communication to the patentees—Glenfield & Kennedy, Ltd., Kilmarnock, Scotland, would result in a further description of the anti-freezing features.

E. Bruce Ball.

Ayr, Scotland,
Dec. 18, 1930.

Grandstands, Bleachers and Stadiums

Sir—In discussions of elevated seating accommodations one finds that the terms grandstand, bleachers and stadium are used loosely and indefinitely. The following statement is offered as a consistent set of definitions of these terms.

The term "stand" denotes that type of seating in which the entire deck construction is solid, the risers functioning to carry loads to inclined stringers, thence to columns and foundations to which the supporting framework is permanently attached. Seats may be supported by treads or risers.

"Grandstand" means a stand with roof for protection against the weather.

"Bleachers" denotes that type of seating in which the riser space is left open, the treads functioning to carry loads to inclined stringers, thence to columns and foundations. Seat brackets, if any, are fastened to inclined stringers. Bleachers are classified as portable (knockdown or removable) and permanent (or fixed), respectively. Portable bleachers are designed for easy erection and dismantling for storage or reerection at another location. Permanent bleachers are securely fixed to foundations.

The term "stadium" refers to an outdoor athletic plant consisting of a play area partly or entirely surrounded with dignified seating accommodations costing at least as much as the play area. Otherwise, the plant is referred to as an athletic field.

Obviously, the use of the term stadium when stand, grandstand or bleachers is meant should be discouraged.

New York City,
Feb. 13, 1931.

Myron W. Serby,
Consulting Engineer.

Design of Circular Tank of Reinforced Concrete

Sir—With reference to the article entitled "Design of Circular Tank of Reinforced Concrete" appearing on p. 923 of your issue of Dec. 11, I am interested in the statement of Mr. Rasmussen that the methods for the design of circular reinforced-concrete tanks are not generally available.

This problem has been completely analyzed in the "Standards of Design for Concrete" of the bureau of yards and docks, U. S. Navy Department, published in November, 1929. The analysis contained in that book is complete, with diagrams and a statment of the design procedure in detail. It also discusses the design of the base of a circular reinforced-concrete tank, which is in itself no simple problem.

Mr. Rasmussen's analysis is very approximate. His assumption that there is a finite distance at which the influence of the restraint at the base terminates is an approximation which might lead in some cases to serious error. Reference to the standards of design mentioned above will indicate that in some cases the pressure on the cantilever elements in the side walls may be inward with the tank filled, and that there may be more than one point of inflection for the vertical moment.

B. Moreell,
Lieutenant-Commander (C.E.C.), U. S. Navy.

Puget Sound, Wash.,
Jan. 22, 1931.

NEWS OF THE WEEK

Dallas Board Rejects School Bids With Fees for Estimating

THE entire lot of twelve bids received for the construction of the new Robert E. Lee school was thrown out Feb. 10 by the Dallas board of education because all the contractors had included an extra sum in their bids to be distributed as estimating fees. It is reported that each bidder added $1,650 to his proposal to be prorated among the unsuccessful bidders. A low bid of $107,732 was submitted by Eckert-Burton Construction Co. On the proposal form for the bid the school board had inserted a clause as follows:

"The undersigned hereby declares that he has not entered into any agreement with the other bidders on the project, or any organization, whereby he obligates himself to include in his bid any sum to be paid to any unsuccessful bidders, neither has he so included any such sum in his bid."

On each one of the twelve proposals this paragraph was cut out. Since rejecting the first bids the project has been readvertised and the second set of bids was opened Feb. 24. The school board declares that the contractors must have agreed before taking out a set of plans for bidding that they did not enter into any agreement to include in their proposal any sum to reimburse other bidders. The local chapter of the Associated General Contractors, sponsoring the bidding fee system, declares the contractors will stand by the estimating fee agreement. The school board threatens to call in outside contractors if the local contractors maintain their stand.

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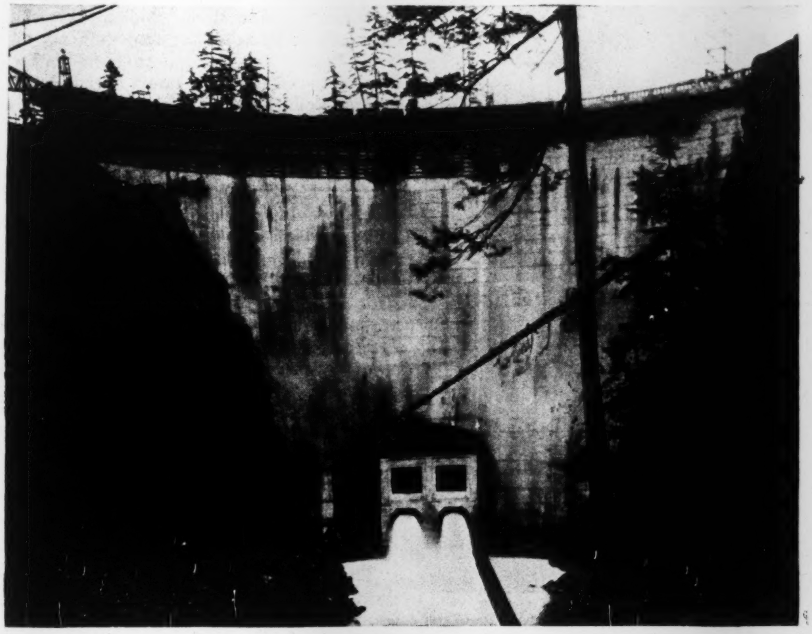
Court Upholds Diversion of Connecticut Water by Boston

The U. S. Supreme Court on Feb. 24 handed down a decision sustaining the report of Charles W. Bunn, special master, that diversion of water from tributaries of the Connecticut River by the Metropolitan Water Supply District of Boston as authorized by the war department will not result in substantial injury to the State of Connecticut. The report of the master was summarized in *Engineering News-Record*, May 29, 1930, p. 911. The supreme court has acted without prejudice, thereby reserving the right of Connecticut to file suit against Massachusetts in the future should injury be threatened by the allowance of increased diversions.

CUSHMAN NO. 2 DAM NEARLY COMPLETED



Construction of the dam for the Cushman No. 2 power plant of the city of Tacoma, Wash., work on which was started in May, 1929, is now practically completed except for the spillway section, which is expected to be finished in March. The dam, of the simple arch type, 240 ft. high and 500 ft. across the crest, is located on the Skokomish River, about 2 miles below the No. 1 plant.

Low Rate for Hoover Dam Bond

The Towner Rating Bureau, of New York, has set a rate of $16.875 per thousand for the surety bond to be given by the contractor awarded the Hoover Dam, according to the department of the interior. On an estimated contract price of $55,000,000 the bond premium would amount to $928,125. The rate is 25 per cent lower than that made for the San Gabriel project, the nearest comparable work. Assumption of certain hazards by the government and the assurance that workmen will be properly housed and taken care of are reasons given by the department for the low rate.. The amount of the surety bond will be $5,000,000.

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New York Engineers Hear New Vehicular Tunnel Plans

Plans for the new 38th St. vehicular tunnel under Manhattan Island and the East River were described to the regular monthly meeting of the New York section of the American Society of Civil Engineers on Feb. 18 by J. R. Slattery, deputy chief engineer of the board of transportation, which has the work in charge. About 800 members and guests were present for the technical session and subsequent social gathering. Speakers besides Colonel Slattery were Robert Ridgway, Ole Singstad, Harold M. Lewis and John F. O'Rourke.

According to present plans, which are still subject to change, the eastern end of the tunnel will consist of a Y, one arm extending to Queens and the other to Brooklyn. At Long Island City traffic will be brought to an open-air plaza, where it can be sorted according to different destinations. A similar and more complex plaza is planned for the Manhattan end of the river tunnel or tunnels, for two 31-ft. tubes are contemplated.

The east side plaza on Manhattan is bounded by First and Second Aves. and 36th and 38th Sts. At this point westbound traffic may leave the tunnel for uptown or downtown east side destinations or may cross the plaza and continue crosstown in the single tunnel under 38th St. To accomplish this latter purpose, however, it must negotiate a 360 deg. spiral, following roughly the exterior boundaries of the two-block plaza, and thus travel approximately 3,000 ft. farther than if it could go direct from the river tunnel into the land tunnel.

Colonel Slattery described this unusual plan as the least of several evils from which the engineers had to choose. The fundamental and guiding desire in planning the tunnels was to permit uninterrupted flow to crosstown traffic. Branch tunnels of any kind, permitting vehicles to enter or leave the fast-moving lines of traffic, were held to conflict seriously with this desire. The open-air plazas and the complicated spiral are stated to be the necessary result. It was pointed out that the extra time required in passing around the spiral was negligible, even at a speed of 20 m.p.h., when compared with the delays which branch tunnels would cause. A third open-air plaza is planned in the vicinity of Tenth Ave. on the west side of Manhattan where the tunnel will connect with the Port Authority's projected tunnel under the Hudson River to Weehawken.

In general plan the board of transportation's tunnel will be similar to the Holland tunnel, with air ducts above the ceiling and below the roadway. A roadway 21 ft. wide instead of 20 ft. is planned and the capacity of the ventilation system will be considerably greater than that of the Holland tunnel because of the considerably greater length of the new tunnel. In discussion Mr. Singstad questioned the advisability of locating exits and entrances so close as is done on the east Manhattan plaza and also questioned the need for as many as 224 fans for the ventilation system. Mr. Lewis pointed out how the tunnel fits into the highway network of the Regional Plan.

Connecticut Engineers Meet at New Haven

Economic problems of stream pollution discussed—Outline given of studies leading to recommendations for an additional bridge at Hartford—Honorary membership conferred on the late Edward Gagel

Engineering News-Record Staff Report

ENGINEERS from all parts of Connecticut, more than 150 in number, gathered at New Haven on Feb. 17 and 18 for the 47th annual meeting of the Connecticut Society of Civil Engineers. The two-day session opened with a business meeting at which the result of the balloting for the new officers was announced. Elmer C. Welden, deputy highway commissioner of Connecticut, Hartford, Conn., was elected president, and Prof. Charles A. Wheeler, of Connecticut Agricultural College, and Prof. Charles F. Farnham, of the engineering department of Yale University, were elected vice-presidents. Benjamin H. Palmer, Jr., of Norwich, was elected a director, and Clarence M. Blair, of New Haven, was reelected secretary-treasurer.

Water Pollution Problem

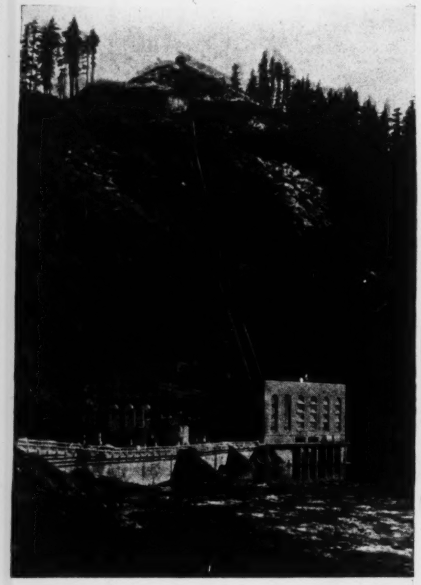
The technical sessions were opened with a paper upon the work of the Connecticut water commission by Sanford H. Wadhams, director of the commission. The Connecticut water commission has been in existence about five years. It was set up as an economic rather than as a sanitary body, originally proposed for the purpose of dealing entirely with the matter of the disposal of trade wastes, but in the final set-up the commission was given power over both industrial waste and domestic sewage pollution. The commission may order any municipality or industrial organization to desist from polluting the streams of the state, but in so doing must stipulate how the pollution can be stopped and must be able to show that the cost will be within reason.

Because of this requirement that the commission be able to say how pollution may be stopped, it has undertaken a number of studies of methods of disposal of trade wastes (means of disposing of domestic sewage being fairly well understood) in cooperation with the research department of the universities and colleges of the state.

Since its organization the commission has had its duties enlarged to include handling the matter of the control of interstate water, the collecting and recording of stream gagings, and a survey of the water resources of the state. Recently it proposed to the governor that a conservation commission be set up to take over its duties and such functions of other state bodies as are concerned primarily with water problems.

More than a year ago the State of Connecticut appointed a commission to look into the need for, and the practicability of, building a new bridge over the Connecticut River at Hartford. In January of this year the commission made its report to the legislature recommending that such a bridge be built and outlining what its character should be and its cost. Clarence W. Hudson, consulting engineer, New York, is engineer of the commission.

UTILITY ENLARGES PLANT



The Oak Grove plant of the Portland General Electric Co., Portland, Ore., has been enlarged by the addition of a second penstock line and a 40,000-hp. reaction turbine. The normal operating head is 849 ft., the highest head reaction turbine installation in this country.

In an illustrated talk he described the conditions to be met and the proposed method of meeting them. As all traffic now crossing the one bridge over the river in the neighborhood of Hartford must pass through the congested central district of the city, Mr. Hudson has recommended that the new bridge be built considerably downstream from the existing bridge at a point where traffic from converging highways approaching Hartford from the south and west can be diverted from the center of the city. The Connecticut River at that point is navigable and as the physical conditions on the Hartford side of the river lend themselves to an elevated approach highway, a high-level crossing, clearing the flood level in the river by 70 ft., is recommended in preference to a low-level crossing with a drawspan. The type of bridge recommended in the commission's report is a cantilever structure having a clear span of 832 ft. over the river channel and side spans of about 600 ft. Deep foundations will be required, as rock is at depths generally in excess of 60 ft. below low water.

The first day's session closed with the annual banquet of the society, at which Harold S. Boardman, president, University of Maine, and also president of the Society for the Promotion of Engineering Education, spoke on the engineer as an educator and pointed out how many engineers outside of the teaching staff of our schools and colleges are contributing in large measure to general education on broad lines.

Honorary membership in the society was to have been conferred upon Edward Gagel, former chief engineer of the New Haven Railroad, at the annual banquet, but his death occurred on the preceding Thursday. The award, therefore, was made posthumously, Charles Rufus Harte, for many years a close personal friend of Mr. Gagel, accepting the award for Mr. Gagel's family. The award was made by C. C. Elwell, himself an honorary member and past-president of the society, who pointed out the large contribution to civil engineering development made by Mr. Gagel in his long service as chief engineer of the New Haven Railroad.

Engineers' Broader Work

The need for engineers to extend their interests far beyond the narrow limits of their technical work was emphasized by J. Frederick Jackson, New Haven, in a paper entitled "Setting Up and Sighting" at the opening of the second day's session. Other papers at this session were upon the mechanical developments of the Emmett mercury process, by H. N. Hackett, of the General Electric Co.; one upon the application of arc welding to building construction, by A. G. Leake, of Bridgeport, and another on the development and construction of golf courses, by R. J. Ross, of Hartford. There also was a paper on the development and use of rock asphalts by M. A. Lippman, New York, and an illustrated paper on the use of micro-movies in the study of microscopic organisms in sewage-polluted water by John B. Hawley, Fort Worth, Tex., with a discussion by William R. Copeland, of the Connecticut water commission.

Concrete in Buildings Discussed Before Philadelphia Engineers

A WELL-BALANCED program of papers on the general subject of concrete in building construction was presented to a large audience of engineers in the auditorium of the Engineers Club of Philadelphia on Feb. 17. The meeting was in charge of a committee under the chairmanship of F. O. Dufour and was held in two sessions, afternoon and evening. In the afternoon concrete masonry back-up, architectural and decorative concrete, and inspection and testing were discussed. The subjects of the evening session were lightweight aggregate, reinforced-concrete column tests, rigid-frame structures and floor finishes.

Masonry Back-Up

One-half of the masonry back-up blocks used are made from cinder concrete, said W. E. Rosengarten, engineer, Lower Merion Township, Pa. Necessary qualities for blocks are strength, insulation and constancy of volume. Piers of cinder concrete blocks develop 50 per cent of the individual block strength, whereas most other types of back-up units do not develop more than 25 to 30 per cent of the block strength when set up in piers. Mr. Rosengarten also stated that the rough finish on cinder concrete blocks was of considerable value in sound insulation.

William J. Hutchinson, of Dreer & Churchman, architects, Philadelphia, stressed the importance of the specification writer in determining proper back-up. Particularly is it necessary to specify the type of cinders to be used. Mr. Hutchinson placed a limit of 20 per cent on the amount of unburned coal that should be permitted. Curing for 28 days should be the minimum. Shrinkage may be reduced by using a relatively lean mortar. It is also important in reducing shrinkage to lay the blocks rapidly so that the joints may be placed in compression as soon as possible.

Architectural Concrete

F. S. Onderdonk, professor of architectural history, University of Michigan, gave an illustrated lecture on his specialty, the ferro-concrete style, showing many unusual buildings, largely in Europe, in which concrete is made in forms which express its characteristic of flowability. Professor Onderdonk is a particular champion of the parabolic arch for buildings and showed many interesting structures in which it has been used. W. E. Hart, of the Portland Cement Association, followed Professor Onderdonk with a similar discussion of buildings in the United States in which architectural effects in concrete have been secured by accentuating the form marks, by placing half-rounds on the interior face of the forms or by the use of plaster-of-paris forms held in place inside the structural forms.

A paper by John J. Early, architectural sculptor, Washington, D. C., who has done much of the fine colored mosaic concrete work in this country, stated that the art of decorative concrete is still in a period of transition. Mr. Early has discarded the idea of using pigments because the neutral color of the cement kills most colors. It was also pointed out that as concrete ages, the cement tends to inclose the pigment particles, thus accounting for the fading of colored concrete.

Inspection and Testing

Meyer Hirschthal, concrete engineer, Delaware, Lackawanna & Western Railroad, described the huge freight terminal which this company has recently completed in Jersey City at the end of the Holland vehicular tunnel. (*Engineering News-Record*, March 27, 1930, p. 519.) R. L. Bertin, White Construction Co., New York, spoke on the importance of inspection. Uniformity of concrete, one of the most important essentials, rests directly on proper proportioning and placing, which in turn depend upon inspection. Mr. Bertin pointed out that present tests for control of concrete uniformity are not adequate, because the slump test does not measure proportions and the cylinder breaking tests are made after the concrete is in place. There is necessity for a test which will indicate proper proportions and uniformity at a time when test results can be applied to field work. The subject has been studied by a committee of the American Society for Testing Materials, which has before it several suggested methods for determining the constituents of fresh concrete. These methods are known as the Griesenauer, the Bertin and the Dunagan methods.

The paper on lightweight aggregate by A. W. Munsell, engineer of masonry inspection, Port of New York Authority, was read by Mr. Pittman, of the Port Authority testing laboratory. The paper was concerned with tests which the Port Authority has recently made, looking to the use of a lightweight aggregate (in this case Haydite) concrete floor for its bridges. The strength of the Haydite concrete was found to be satisfactory, but the cost was excessive because of high freight rates from Pittsburgh, the nearest point of supply.

Prof. W. A. Slater presented the first results of the reinforced-concrete column investigation which is being carried out simultaneously at the laboratories of Lehigh University and the University of Illinois. One of the principal objects of the investigation is to determine the division of stress between steel and concrete at different ages. Complete results of the investigation will be published later. So far it has been determined that the longitudinal steel carries an increasing amount of stress and the concrete a decreasing amount with age. Spiral reinforcement apparently has an important effect in strengthening the column under long-time loading.

W. H. Gravell, consulting engineer, Philadelphia, emphasized the importance of structural steel incasement in tall buildings from the point of view of added strength. In Mr. Gravell's opinion 20 to 30 per cent additional strength is imparted to steel members from stone concrete fireproofing, and he has used this assumption on several buildings.

A. G. Hayden, design engineer, Westchester County Parkway Commission, New York, described the rigid frame bridges which he has developed and built. He also touched upon recent developments in skew arch design, which it is believed has been rationalized and made more certain. Mr. Hayden described some interesting photo-elastic studies made at Massachusetts Institute of Technology which showed clearly how the neutral axis approaches the interior corner of the knee of a frame and how the compressive stresses increase and tensile stresses decrease in the region of the knee. The tests indicate that square knees were safe but that a filleted corner is somewhat better structurally.

Prof. Clyde T. Morris, Ohio State University, continued the discussion on rigid frames by demonstrating the application of the Cross method of analysis, by distributing fixed end moments, to the problem of wind design in tall buildings. Professor Morris demonstrated how comparatively simple the analysis of rigid frames had been made by this important method, and characterized it as an engineering method as distinct from the slope deflection method, which is mathematical.

Two discussions on floor finishes completed the program. John G. Ahlers, of the Barney-Ahlers Construction Corp., New York, pointed out the difficulty in determining the exact causes of failures of floor finishes because of the many factors involved. There are certain fundamental principles of mixture and manipulation in floor finishing, but in Mr. Ahlers' opinion it will always remain an art in which the workman's judgment is of paramount importance. Charles Schwertner, contractor, of Philadelphia, pointed out the importance of manipulation in producing good floors.

Cement Industry Further Confused by New Investigation

An investigation of the cement industry to ascertain whether there are any violations of anti-trust laws or unfair trade practices in the sale of both domestic and foreign cement has been authorized by the Senate.

The new investigation is to be by the Federal Trade Commission. That commission now has under way an investigation of the use of the basing-point method of establishing prices. Another investigation is being conducted by the Tariff Commission.

Recent attempts to stabilize conditions in the cement industry through the adoption of a new marketing policy have not been successful, and this investigation is expected to add to the confusion. Dealers in building supplies have opposed elimination or cut in the traditional differential of 10c. per barrel. The National Builders Supply Asosciation, on Jan. 12, through its cement committee, under the spur of this opposition adopted a counter proposal actually embodying the principle of the so-called Lehigh stabilization plan but specifying a 10c. per barrel protection and quarterly instead of annual payments of earned differentials. Several state associations took similar action, but met strong resistance on the part of cement companies and some threat of complete elimination of the dealer protection.

Several small dealers actually did withdraw from the new plan, announcing a flat price and no recognition of dealers. On Jan. 23 the Universal Atlas Cement Co. announced restoration of old sales policy with prices subject only to usual cash discount of 10c. for payment in fifteen days, but no differentials. The Edison Portland Cement Co. followed, going back to its old basis on cash discounts but quoting prices without differentials. Others took similar action.

On Feb. 2 the Lehigh Portland Cement Co. reiterated its confidence in its original plan which precipitated the present confused condition, continued the 5c. per barrel service, payment to be made annually, and adjusted its price lists to competitive levels except for the 5c. item to protect dealers. Subsequently it warned dealers that competitive pressure might force a change.

Further confusion was added by an announcement by the Medusa Portland Cement Co. on Feb. 17 reiterating its decision to eliminate all service payments to dealers and to sell at its lowest price to federal, state and county authorities and to railroad and hydroelectric companies, contractors buying without requiring dealer service; also announcing that it will protect only dealers performing their full functions.

This leaves the industry divided into three groups: (1) those still adhering to the Lehigh plan (chiefly Lehigh and Alpha); (2) those quoting flat prices without dealer protection; and (3) supporters of the International Cement Co. in rejecting the Lehigh plan and still adhering to the old 10c. differential.

Northeastern Road Officials Meet

Highway beauty and safety, construction methods and administration problems discussed at Atlantic City

ASSEMBLING in Atlantic City, N. J., on Feb. 18, members of the Association of Highway Officials of the North Atlantic States devoted the major portion of three days to the interchange of information on various phases of highway construction, administration and use in the New England and Middle Atlantic States. A well-planned program resulted in full attendance at all sessions of the meeting. Total registration exceeded 1,500 persons.

Developments in Highway Engineering

Two new developments in the field of highway engineering—roadside beautification and safety—were the subjects of papers presented by Jay Downer, chief engineer of the Westchester County park commission, N. Y., and James S. Bixby, district engineer of the New York state department of public works. Mr. Downer, after commenting on the rapidly increasing public interest in roadside beautification, related the experience of Westchester County in the construction of a parkway system in which care was taken, from the start, to conserve and develop the esthetic features of the new highway. An essential feature of the Westchester type of parkway is the control of a strip of territory sufficiently wide to provide a bumper strip along the paved way which is used to conserve the native beauty of the countryside or to create a synthetic landscape which forms a screen between motor vehicles and adjacent private property. The result has been not only the elimination of billboards and kindred detriments but also a large enhancement in the value of adjacent private property for residential purposes.

Safety on the Highway

Mr. Bixby's paper treated of design and construction features from the safety viewpoint, with reference to multi-lane pavements, sight distances, shoulders and gutters, highway lighting and many other features. He brought out the fact that three-lane pavements, although resulting in a great increase in capacity over the two-lane road, attained this increase at a great cost in safety. The center lane, which must be used by vehicles traveling in two directions, has been productive of many accidents. Another bad feature of the three-lane pavement is the tendency of drivers to avoid the side lane when traveling at high speed. To eliminate or reduce this, Mr. Bixby proposes a 12-ft. width for the side lane, and also advocates the serious consideration of four-lane pavements in all cases where two lanes are inadequate. In concluding his paper, Mr. Bixby presented a powerful plea for the more effective regulation of highway use. Present laws on this subject, in his opinion, are inadequate and unsatisfactory, and should be revised and simplified with the benefit of technical leadership. He believes that the engineer should no longer be content to construct a road alone, but should also take a prominent part in determining the manner in which a road shall be used.

Low-Cost Roads

Construction of single-lane concrete pavements to provide an all-year highway for agricultural trucks was advocated by Samuel Knopf, principal assistant engineer of the Delaware department of highways. This procedure has worked out excellently in Delaware because lack of local roadbuilding material has made it necessary to import aggregates for all types of roads. Delaware has had experience with sand asphalt roads, slag, sand-clay and one-course concrete for secondary pavements. Advantages of the latter include lower maintenance cost and the possibility of using and conserving the existing investment when the road is widened at a subsequent date.

Discussion of Mr. Knopf's paper by R. B. Traver, county superintendent of highways for Onondaga County, N. Y., brought out the fact that that county has 40 miles of single-lane concrete road, which is believed to be the best solution of the all-year paving problem on roads carrying less than 700 vehicles per day. The single lane is laid on one side of the center line, the side being selected to favor the direction of travel of loaded trucks. Sub-grade and drainage structures are built to the full width of the road and are well maintained so that turnouts can be made when necessary without great reduction in speed.

Further data on the single lane concrete pavement were given by L. E. Andrews, of the Portland Cement Association. This type is largely used in Illinois and other Middle Western States. It usually costs no more than a two-lane water-bound macadam surface, a 9-ft. slab 7 in. thick costing from $10,000 to $15,000 per mile.

Concrete Aggregates

Results of durability and freezing and thawing tests on concrete aggregate were related by Dr. G. W. Ward, geologist and petrographer, Portland Cement Association. H. F. Gonnerman, manager of the research laboratory of the same organization, was co-author. The important factors in the durability of concrete are the quality of the mortar paste, the grading of the aggregate and the physical characteristics of the latter. Shale and argillaceous material generally should be avoided. Other factors affecting durability but outside the scope of the paper included methods of construction and methods of concrete mixing and placing, as well as attention paid to curing.

R. B. Gage, chemical engineer of the New Jersey state highway department, presented conclusions regarding the durability of concrete reached as the result of field experience in that state. Mr. Gage expressed the necessity for mixing concrete at the maximum possible density and the methods of proportioning which will attain this end. Care should be taken to determine and maintain a grading of the coarse aggregate which will reduce voids to the minimum, and enough fine aggregate should be provided to fill the voids of the coarse, with an allowance which usually approaches 11 per cent to provide for proper workability of the concrete. The cement content should not exceed 1 part to 1¾ parts of fine aggregate. Present New Jersey highway specifications provide for a minimum strength of 5,000 lb. per sq.in. at 28 days, a standard which is maintained by standardizing equipment, ample and efficient inspection, provision of coarse aggregates in two sizes, proportioning for minimum voids, proportioning by weight, and frequent checking of the mix by inspectors.

Fill Settlement by Dynamite

Details of a method developed in the southern part of New Jersey for settling highway fills with the use of explosives were given by J. A. Williams, division construction engineer of the state highway department. This method has been developed over a period of several years in an effort to stabilize embankments made over silt beds averaging 30 ft. in depth. These are in tidal marshes. In general, the method consists in placing a fill, blowing out the compressed mud underneath and permitting the superimposed fill to settle to hard bottom before the mud has an opportunity to flow back into place. Further details will be given in a subsequent issue.

Bituminous Pavement and Surfaces

Latest developments in the use of bituminous materials for new paving and reconstruction were outlined in a paper by Prevost Hubbard, of the Asphalt Institute, New York City. A discussion of this paper by William L. Mason, district manager of the American Tar Products Co., New York City, brought out approximate costs and traffic capacities of single- and double-surface treatment, mixed in place or retread treatment, bituminous macadam pavement and cold laid premixed pavement.

Bridge Construction

General conditions affecting highway bridge construction were treated by Morris Goodkind, bridge engineer of the New Jersey state highway department. On the average highway bridge, it was stated, the location is definitely fixed, and the type of structure is more or less definitely indicated by location conditions. Conditions at the site affect both substructure and superstructure, and should be determined before a final choice of type is made. Good bridge design, according to Mr. Goodkind, takes account of maintenance problems and avoids details which will call for frequent or costly maintenance. New Jersey now makes a practice of incasing all steel in concrete to avoid the necessity for painting. In closing, Mr. Goodkind brought out the fact that highway grade separations, usually calling for bridge construction, are a matter of increasing importance and will undoubtedly increase in number during the next few years.

A non-technical illustrated lecture, "Fifty Years of Progress in Bridge Engineering," was presented by D. B. Steinman, consulting bridge engineer, of New York City.

Administration Problems

"Highway Accounting and Statistical Information" and "Highway Publicity" were the titles of two papers presented by members of the Connecticut state highway department. The first was given by C. G. Nichols, executive deputy commissioner; the second by Clarence G. Willard, of the state highway publicity bureau.

Methods adopted to facilitate the flow of traffic through congested areas were described by Burton W. Marsh, city traffic engineer of Philadelphia, who pointed out that the ultimate remedy for congestion must take the form of bypass, elevated and depressed express highways. In the meantime, however, it is possible to alleviate congestion by a number of expedients, including the use of signs, signals, parking control, pavement marking and one-way streets.

At the concluding session of the convention, unanimous approval was given to a number of resolutions, including an indorsement of the Gillett bill, now before Congress, providing for an increase in the maximum cost of federal-aid roads. For the present arbitrary limit of $15,000 per mile would be substituted the limit of $7,500 per 10-ft. traffic lane, with a limit of four such lanes on any single highway. The convention also approved a resolution directing the appointment of a committee to consider safety provisions and propose suitable traffic laws as a substitute for the complicated and unworkable statutes in force at present.

The Business Outlook

Business changes from week to week are still slight and not uniformly upward. On balance January averaged a little better than December, and the first two weeks of February have shown a resumption of the rising tendency. Steel activity continues to increase slowly; building contracts, especially in the residential field, have lately shown a fairly distinct improvement, and merchandise car. loadings are doing a little better. Securities buyers seem disposed to stake something on the fair chance that business has been resting on a real, not a false, bottom these past two months, and the shorts are far less sure of themselves than in a long time.

—*The Business Week,* Feb. 25.

WASHINGTON NOTES

By PAUL WOOTON
Washington Correspondent

Congress Advised Against Placing Railroad Holding Companies Under Interstate Commerce Commission

CONGRESS has been advised by Walter M. W. Splawn, counsel for the House committee on interstate and foreign commerce, to defer legislation placing railroad holding companies under federal regulation until all holding companies engaged in interstate commerce have been investigated with a view to determining whether such restraint is necessary.

Mr. Splawn's recommendation for deliberate consideration of a much greater measure of regulation far overshadows in significance his proposal for immediate enactment of legislation that merely would place within the jurisdiction of the Interstate Commerce Commission the acquisition of the control of any railroad, whether by holding company or otherwise, resulting in affiliation with another road. By indirection, this expedient legislation would impose a modicum of regulation upon railroad holding companies, such as the Pennroad and Allegheny corporations, that have ignored the commission's ideas to follow their own designs in railroad map-making, but it does not extend to the holding companies' own conduct in the issuance of securities or in other matters which affect the interests of the public.

Furthermore, the investigation into holding companies that Mr. Splawn proposes would be limited only by the interpretation given to the words "engaged in interstate commerce." This includes, besides the railroad holding companies, others controlling telephone, telegraph and radio properties; electric light, power, gas and water; possibly banking, insurance and investments.

Barge Line on Ohio Opposed

Extension of the government barge line up the Ohio River, as proposed in a Senate resolution, is opposed in a report that has been sent to the Senate commerce committee by Secretary of War Hurley. Under the inland waterway act, the barge line is permitted to operate on the other tributaries of the Mississippi, but is expressly excluded from the Ohio. As soon as the views of the war department were made known, Senator Brookhart, of Iowa, author of the resolution, stated that he will reintroduce it next session and will ask for a thorough study of the government's inland waterway policy.

Secretary Hurley pointed out in his report that the intention of the government in operating the Mississippi barge service is to demonstrate to private capital the feasibility of inland waterway navigation. The whole theory of the operation is to bring about better coordination of railways, waterways and highways, Mr. Hurley stated. As the success of government operations has induced private carriers to develop service on the Ohio, he does not feel that the federal barge line should now be extended to invade this territory.

Whatever opinion the war department may have on the matter, the sentiment is gaining ground in the Senate that if the government is going to operate barge service at all, it should not exclude one of the most important tributaries of the Mississippi from its operation. This attitude is particularly strong among Senators from states bordering the Missouri who feel that an important east to west waterway could be established from points on the Missouri to Pittsburgh and other cities on the eastern end of Ohio.

Oregon Railway Extension Authorized

For the purpose of tapping six billion feet of lumber in the basins of Suislaw River and Wolf Creek, Lane County, Oregon, the Oregon Electric Railway has been authorized by the Interstate Commerce Commission to construct, at an approximate cost of $1,231,000 advanced by the Great Northern and the Northern Pacific, a 25-mile extension from a connection near Eugene with the Southern Pacific's Coos Bay branch to the Suislaw River, via Hadleyville, with a 10-mile branch extending from the latter point to Panther, on Wolf Creek.

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F. C. Emerson, Engineer Governor of Wyoming, Dies

Frank C. Emerson, who began his second term as governor of Wyoming on Jan. 5, died in Cheyenne on Feb. 18. Governor Emerson, who was born in Saginaw, Mich., on May 26, 1882, was graduated from the school of civil engineering, University of Michigan, in 1904 and soon after his graduation moved to Wyoming, where he had since engaged in engineering and construction work.

In 1905 Mr. Emerson had charge of the location for the state of two large canals proposed for the reclamation of the ceded portions of the Shoshone Indian Reservation. In 1907 he was chief engineer of the Wyoming Land & Irrigation Co., which position he held until 1915, when he became superintendent of the Big Horn Canal Association and Lower Hanover Canal Association, and engineer for the Worland Drainage District and for the Wyoming Sugar Co. In addition to this work, he maintained a general consulting practice at Basin, Wyo. On July 1, 1919, he became state engineer, serving until 1927, when he became governor.

In addition to his regular official duties as state engineer, Mr. Emerson served as the Wyoming commissioner on the Colorado River Commission, which drafted the Colorado River Compact, and Wyoming representative upon the board of review upon the North Platte cooperative investigations.

He was a member of the American Society of Civil Engineers.

Work Begun on Bridge Across Zambezi River

Construction of a bridge over the Zambezi River, in Nyasaland, southeastern Africa, discussed for a decade in the British House of Commons, has at last been sanctioned and work started.

The bridge will cross the river from Sena to Mutarara, and will be 12,066 ft. in length, or just over 2¼ miles. It will be 54 ft. above average water level and 27 ft. above the highest known flood level. Only a comparatively small length will be over the normal Zambezi bed. The bridge will run inland for 500 ft. on the Mutarara side but for nearly 2 miles on the Sena side, this being low country, subject to floods. Included in the bridge are 30 spans of 266 ft. The bridge will carry a single railway track and a sidewalk. Its cost will be between $7,500,000 and $10,000,000. It is expected that about four years will be required to construct it.

SOCIETY CALENDAR

AMERICAN CONCRETE INSTITUTE, Detroit; annual convention, Milwaukee, Feb. 24-26.

AMERICAN RAILWAY ENGINEERING ASSOCIATION, annual convention, Chicago, March 9-12.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; regional meeting, Pittsburgh, March 18.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York; spring meeting, Norfolk, Va., April 15.

AMERICAN WATER WORKS ASSOCIATION, New York; annual convention, Pittsburgh, Pa., May 25-29.

FLORIDA SECTION, American Water Works Association, in cooperation with the state board of health and the University of Florida, will hold the second annual water-works short school at West Palm Beach March 31 to April 3. The fifth annual meeting of the Florida section, A.W.W.A., will be held on the last two days of the meeting.

LOS ANGELES SECTION, American Society of Civil Engineers, held its regular monthly meeting on Feb. 11, at which the speakers were H. L. Doolittle, chief designing engineer, and C. B. Carlson, structural designing engineer, of the Southern California Edison Co., Ltd., who discussed structural and mechanical features of the new Edison Building at Fifth St. and Grand Ave., Los Angeles.

MINNESOTA FEDERATION of Architectural and Engineering Societies will hold its tenth annual convention in Minneapolis Feb. 27-28.

MINNESOTA SURVEYORS' AND ENGINEERS' SOCIETY will meet in 36th annual convention in St. Paul Feb. 26-27.

MOHAWK VALLEY ENGINEERS' CLUB on Feb. 17 had as guest speaker Commander C. A. Pownall, U. S. Navy, who discussed the use of naval aircraft and the design of special power plants. Commander Pownall illustrated his talk with slides released by the navy department for the occasion.

NEBRASKA ENGINEERS' ROUNDUP will be held on Feb. 25 in Lincoln. Cooperating groups include the Grand Island Engineers' Club, Engineers' Club of Omaha, Engineers' Club of Lincoln and the college of engineering, University of Nebraska. The central topic will be "The Significance of Engineering to Nebraska," and the purpose is to make the public better acquainted with the work of engineers and their contributions to society.

NEW MEXICO SECTION, American Society of Civil Engineers, met in Albuquerque on Feb. 18 and heard an address on the methods used in the construction of the Los Angeles aqueduct by J. L. Burkholder, chief engineer of the conservancy district.

SAN FRANCISCO SECTION, American Society of Civil Engineers, at its regular bi-monthly meeting held Feb. 17, heard H. A. Van Norman, chief engineer and general manager of the Los Angeles department of water and power, discuss "The Los Angeles Water-Supply Problems." About 160 were present.

SOUTHEASTERN SECTION, American Water Works Association, will meet in Columbia, S. C., April 7-9. Plans are being made for spending the week end of April 4-5 in Havana prior to the meeting.

Grade-Crossing Accidents Show Marked Decrease

Accidents at highway grade crossings, according to reports to the Interstate Commerce Commission, totaled 4,390 for the first eleven-month period of 1930, a reduction of 989 compared with those for the same period in 1929. Fatalities resulting from such accidents totaled 1,848, a reduction of 400 compared with those for the same period in 1929, while persons injured totaled 4,992, a reduction of 1,133. For the month of November there were 519 accidents at highway grade crossings, a reduction of 143 under those for November, 1929, while 193 fatalities were reported as caused by those accidents. This was a reduction of 73 compared with the number reported for November, 1929. Persons injured in highway grade crossing accidents in November, 1930, totaled 612, compared with 751 in the same month of the preceding year.

Obituary

Marsden Manson, city engineer of San Francisco from 1908 to 1912, died in that city on Feb. 21. Mr. Manson, who was 81 years old, went to California from his native Virginia in 1878 and filled many federal, state and city engineering positions. While city engineer of San Francisco he initiated the Hetch Hetchy water-supply project.

Harry E. Detweiler, chief engineer of the Anthracite Bridge Co., of Scranton, Pa., died on Feb. 19. Mr. Detweiler had been secretary-treasurer and chief engineer of the company since its incorporation. He was a member of the American Society of Civil Engineers.

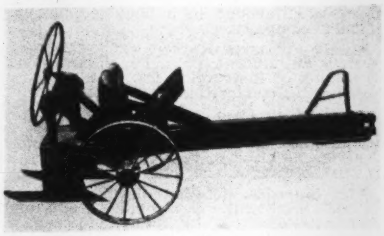
Sheldon E. Minor, of Greenwich, Conn., died of heart disease on Feb. 19. Mr. Minor, who was 70 years old, was graduated from Yale University in 1882. In his 40 years of residence in Greenwich he did virtually all the engineering work on highways, bridges and sewers for the town and borough. He was a past-president of the Connecticut Society of Civil Engineers, and a member of the American Society of Civil Engineers, the New England Sewer Association and the New England Water Works Association.

Bruce F. House, civil engineer with the Fort Worth & Denver City Railroad, Amarillo, Tex., died on Feb. 15, aged 67. He was a graduate of Oberlin College, and joined the Colorado & Southern Railroad, the parent company, about 25 years ago.

Construction Equipment and Materials

Heavy Subgrade Plow

Extremely heavy construction features the heavy-duty plow produced by the Dukelow Hardpan Plow Co., 429 Michigan Ave., Joplin, Mo. This machine, designed for operation with a tractor, weighs 3,000 lb. and is equipped with double interchangeable plow points spaced on 24-in. centers. Depth of cut is regulated by a large hand wheel.



Heavy-duty plow with hand control

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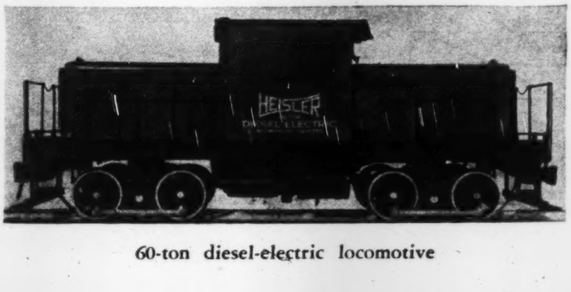
Diesel-Electric Locomotive for Switching Service

Remarkable results have been obtained from the 60-ton, 360-hp., diesel-electric locomotive developed by the Heisler Locomotive Works, Erie, Pa., in a series of dynamometer car tests. This unit is designed especially for high power at switching speeds, and has been built with the definite idea of limiting speed to provide maximum power. It also has very high starting adhesion, as all wheels turn together and no pair can slip and cause loss of starting effort. It is equipped with two 180-hp. Buda diesel engines connected to two Westinghouse direct-current generators, which in turn supply current to two traction motors. The traction motors are spur geared to a central center drive shaft which transmits power to a pair of bevel gears to one axle of each truck. Side rods carry the power to the other driving wheels. The driving gears are mounted in Timken roller bearings. Universal joints in the drive shaft permit the trucks to swivel freely and make it possible for the locomotive to work on extremely short curves. To insure ample air for switching service the locomotive is equipped with two Gardner-Denver duplex compressors, one driven from each engine; the combined output is 118 cu.ft. of air per minute. Westinghouse combined straight and automatic air brakes are used, with an additional hand brake for holding the locomotive when out of service.

Dynamometer car tests with this new unit have indicated a drawbar pull of 47,800 lb. In a direct test on a 3 per cent grade with a 14 deg. curve, the new locomotive, according to the manufacturer, pulled 83 per cent more tonnage than an 80-ton superheated steam locomotive.

Other sizes of this same type, powered with gasoline as well as diesel engines, will soon be available.



60-ton diesel-electric locomotive

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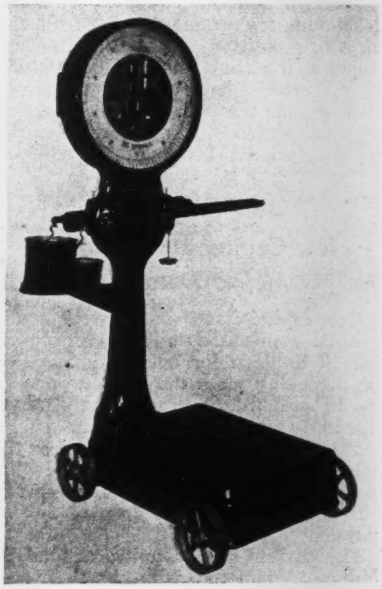
Aggregate Moisture Determined by Automatic Scale

Accurate determination of concrete mixtures with due regard to the moisture content of the aggregates is the function of an aggregate auto-gage which has recently been announced by Toledo Precision Devices, Inc., Toledo, Ohio, a subsidiary of the Toledo Scale Co. This is designed to perform the following operations in respect to concrete aggregates: (1) determine specific gravity; (2) determine per cent of moisture; (3) compensate for surface moisture; (4) show exact weight of dry aggregates; (5) indicate the weight of regular run aggregates; (6) show actual weight of surface moisture; (7) make sieve analysis; (8) show moisture within the aggregates themselves; (9) do regular weighing.



Scale determines moisture content of aggregates

Besides determining the moisture content of the aggregates the auto-gage will automatically and correctly weigh out specified amounts of the various aggregates, compensating for the surface moisture in each. Cement and water then can be added by weight in the right proportion. Operation is based upon the comparison of the weights of the aggregates when submerged in water.

◆

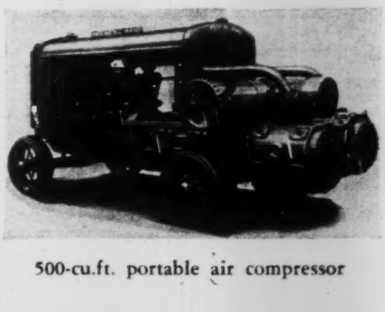
Pump-Mixer Raises Pavements

Paving slabs which have settled out of position can be returned to original grade through the use of the Mud-Jack, a new device announced by the National Equipment Corp., Milwaukee, Wis. The Mud-Jack is a combination mixer and pump which raises hard-surfaced pavements by forcing mixed mud through holes cut in the slab. Top soil and water are used, mixed with just enough cement to take up the shrinkage, usually about one bag of cement to a cubic yard of dry material. For normal operation three holes are drilled for each 8-ft. length of 18-ft. road slab. The device operates effectively to correct dips of from 1 to 18 in. in depth. Use of the Mud-Jack, according to the manufacturer, makes possible the proper maintenance of pavements with a minimum delay to traffic at costs well below the expense of tearing out and replacing.

◆

Large Portable Air Compressor

With a capacity 60 per cent greater than the largest portable air compressor previously offered by the Ingersoll-Rand Co., 11 Broadway, New York City, the recently announced type XL machine is unusual not only in size but also in design, which is distinctly different from that of the smaller machines. The unit consists of a two-stage horizontal compressor connected to a four-cylinder Waukesha gasoline engine through spiral bevel reduction gears operating on ball bearings. Two complete water-cooling systems are provided, one for the compressor and one for the driving motor. Separate automatic lubricating



500-cu.ft. portable air compressor

systems are also used. A radiator-type intercooler cools the air between the stages of compression. Regulation of the machine is automatic. The complete unit, with gasoline tank and air receiver, is mounted on a one-piece cast-steel frame equipped with rubber-tired steel wheels. Removable steel side covers can be locked when necessary.

◆

Special Drawing Table Top Eliminates Tracing

Pencil drawings with solid, even lines which will make blueprints, van dykes and other reproductions as clearly as ink tracings can be turned out, according to the W. H. Long Co., 420 North Clark St., Chicago, Ill., by using its No-Ink drawing-board top. This is a fine, white composition which comes in sheets ⅛ in. thick and can be glued or fastened to old drawing boards or tables. It gives a permanently smooth drawing surface which is tough and resilient. When regular drawing paper is attached to the surface, and a 3-H or harder pencil is used, lines of the proper quality can be drawn by using a double stroke. The pressure of the first stroke ridges the paper, and the back stroke fills the valley thus produced with lead. Changes can be made in any lines by the usual erasing process, and the ridges or valleys will not show on the reproduction. Because of the resiliency of the board, indentations in the surface made by the pressure of drawing tools disappear immediately. Since hard lead is used, the lines do not smudge when worked over, and the tracing can be filed and used for reproduction after any length of time.

◆

3-Yd. Diesel-Powered Dragline

Ability to work on soft ground is a feature of the new 3-cu.yd. crawler-mounted diesel dragline which has been announced by the Bucyrus-Erie Co., South Milwaukee, Wis. This machine, known as the Class 111, is built for use only as a dragline and combines many features that make for big output. It knocks down for shipment in four units, each within railroad clearances. The power unit is a six-cylinder full diesel engine which develops a very high torque, even at slow speeds, and which shows unusual economy in fuel costs. Entire control of all operating motions is by air through valves controlled by small, easily-operated hand levers and pedals grouped in front of the operator's position. This air is supplied by a small compressor built into the engine. The only manual controls are the propelling jaw clutch and the power boom hoist. Other features include steering from the operator's position, ability to swing and propel at the same time box-type lattice boom, large cone swing clutches and silent engine transmission fully inclosed and running in oil. Approximate working weight is 220,000 lb.

COSTS AND CONTRACTS

E. N.-R. Index Numbers

Cost			Volume		
Feb. 1,	**1931**	**196.61**	**January,**	**1931**	**208**
Jan. 1,	1931	194.48	December,	1930	192
Feb. 1,	1930	206.46	January,	1930	199
Average,	1930	202.85	Average,	1930	260
Average,	1929	207.02	Average,	1929	317
1913		100.00	1913		100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of Feb. 26, with some comparisons, total as follows:

(In Thousands of Dollars)

		Average of Last Four Weeks	
Buildings:	Feb. 26, 1931	1931	1930
Industrial	$2,963	$3,529	$4,064
Other	15,444	16,746	24,442
Streets and roads.	9,464	9,170	7,233
Other eng. constr..	6,807	15,129	13,106
Total	$34,678	$44,576	$48,847

Total, all classes Jan. 1 to Feb. 26:

1931	$415,499
1930	434,324

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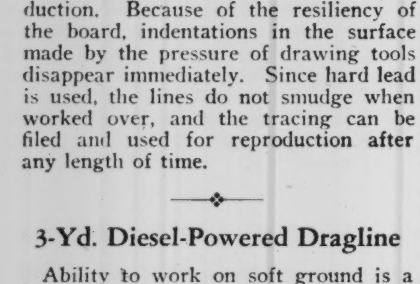
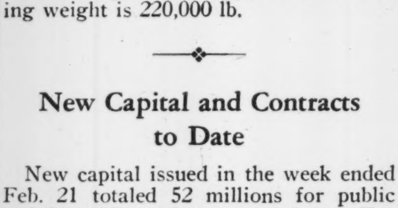
New Capital and Contracts to Date

New capital issued in the week ended Feb. 21 totaled 52 millions for public and 19 millions for corporations. For the preceding week the figures were 93 and 19 millions. Average weekly values for 1931 were 23 millions for public bonds and 55 for corporations. For the year to date the values for public plus corporation are 516 millions, compared with 1,116 last year, a drop of 54 per cent.

The current week's contracts total 50 millions, compared with 36 the week before, 76 millions a year ago, and an average of 47 millions for the whole of 1930. The cumulative figures for the year are 381 millions, compared with 378 last year, a gain of 1 per cent.





New Publications

Roller Bearings—Design data and details of construction of various types of roller bearings produced by the Orange Roller Bearing Co., Orange, N. J., are given in a revised catalog of that company.

Pumps—Worthington Pump & Machinery Corp., 2 Park Ave., New York City, has published two bulletins on vertical triplex power pumps and deep well pumps.

Power Excavators—Bulletin 3012 of the General Excavator Co., Marion, Ohio, devotes twenty pages to explaining the characteristics and design features of the General line of power excavators.

Industrial Plants—Services rendered by the Osborn Engineering Co., 7016 Euclid Ave., Cleveland, Ohio, in the design and supervision of construction of industrial plants are outlined in a booklet published by that company.

Levels—Warren-Knight Co., 1650 North Twelfth St., Philadelphia, Pa., has issued a 52-p. book of instruction telling how to use the Sterling convertible wye level.

Contractor's Pumps—A series of questions and answers bringing out advantages of Humdinger self-priming centrifugal pumps is given in an 8-p. bulletin issued by the Ralph B. Carter Co., Hackensack, N. J.

Aluminum—A detailed discussion of the methods used in the electroplating of aluminum, supplemented by many illustrations, is given in a 36-p. booklet published by the Aluminum Company of America, Pittsburgh, Pa.

Steel Products—Truscon, a graphic monthy devoted to construction, maintenance and steel products which is sponsored by the Truscon Steel Co., Youngstown, Ohio, has made its first appearance in the form of a 16-p. rotogravure bulletin devoted largely to pictorial presentation of the company's products and the ways in which they are manufactured and used. Included in the many items described are channel plates and Insulmesh, two of the company's more recent developments.

Pumps—Non-clogging pumps of the inclosed shaft type are the subject of a 28-p. bulletin 126 of the Chicago Pump Co., 2336 Wolfram St., Chicago, Ill. Single and duplex units are shown, and improvements and advances in design are treated in detail. The booklet also reproduces drawings of many different pump installations, specifications, tables of capacity, heads and horsepower and miscellaneous installation and maintenance data. Another publication of the company is a 2-p. leaflet describing the new N-type small, compact, direct-connected centrifugal pump for industrial uses with capacities of from 3 to 60 gal. per minute.

Grading Machinery—Two recent bulletins of the W. A. Riddell Co., Bucyrus, Ohio, illustrates and describe Warco wheeled scoops and a new line of rear-control power graders for use with McCormick-Deering, Fordson, Case or Allis-Chalmers industrial tractors.

Generators and Steam Engines — Troy Engine & Machine Co., Troy, Pa., has published bulletins 602 and 304 covering, respectively, Engberg generators and steam engines.

Revolving Derricks — Several major changes and a number of minor improvements and refinements in Wiley Whirleys are described in a new catalog of the Dayton Whirley Co., Dayton, Ohio.

Heating Rates—In accordance with its annual custom the Ric-Wil Co., Union Trust Bldg., Cleveland, Ohio, has issued a folder tabulating steam and hot water heating rates in various cities of the United States for the season 1930-31.

Builders' Hardware—Commercial Standard CS22-30, dealing with various types of non-templet builders' hardware, is the subject of a 68-p. pamphlet issued by the U. S. Bureau of Standards which can be obtained from the Government Printing Office at Washington, D. C., at 10c. per copy.

Electrical Equipment—Recent publications of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., include descriptive leaflets on condensate pumps, steam turbine-generator units and industrial electric heating equipment, as well as a 40-p. illustrated bulletin, "Engineering Achievements of the Westinghouse Electric & Mfg. Co. During 1930." Many articles in the latter publication are of particular interest to civil engineers, especially those dealing with hydro-electric and steam power development, lightning arresters, Welland Canal equipment, oil-electric locomotive design and others.

Current Construction Unit Prices

Steel Pipeline in California

A LINE of plate steel pipe 12.7 miles long for the Hetch Hetchy water supply will be constructed in Alameda County, Calif., from San Lorenzo to a junction at Newark with an existing 36-in. pipe of the city and county of San Francisco. Bids were asked Oct. 29, 1930, for three classes of pipe: (1) riveted, 46- and 38-in. diameter; (2) lockbar, 44- and 36-in.; (3) welded, 44- and 36-in. The work was divided into two sections, and both were let Nov. 5 on welded pipe to the Western Pipe & Steel Co., 444 Market St., San Francisco, for $648,867. This company's bid for lockbar pipe was $671,507. No bids were received on riveted pipe.

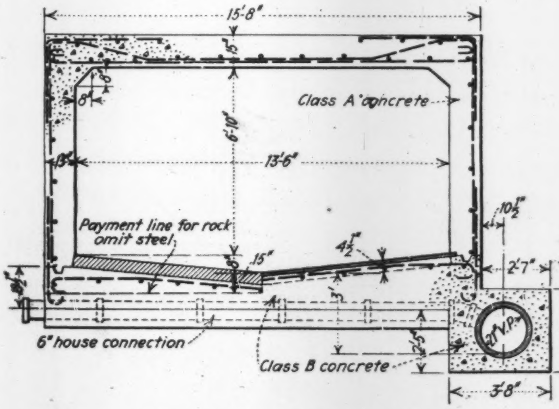
Contract prices are given for the principal items, and also the bids submitted on the two sections by the Montague Pipe & Steel Co. Totals for the latter were $411,600 for sec. 1, the 44-in. welded pipe, and $293,480 for sec. 2, the 36-in. welded pipe.

	Western Pipe & Steel Co.		Montagne Pipe & Steel Co.	
Furnish Pipe:	Unit Price	Amount	Unit Price	Amount
35,000 ft. 44-in. lockbar	$7.87	$275,450	....	....
35,000 ft. 44-in. welded	7.47	261,450	$8.20	$287,000
32,000 ft. 36-in. lockbar	5.73	183,360	....	....
32,000 ft. 36-in. welded	5.46	174,720	5.88	188,160
Deliver and Install:				
44-in. lockbar	1.68	58,800	....	....
44-in. welded	1.68	58,800	1.95	68,250
36-in. lockbar	1.40	44,800	....	....
36-in. welded	1.40	44,800	1.71	54,720
8,000 cu.yd. excav. more than 1 ft. deep	2.42	19,360	2.00	......
10,000 cu.yd. excav. less than 1 ft.	2.42	24,200	2.15	......
40 cu.yd. class A concrete	32.50	1,300	40.00	......
200 cu.yd. class B concrete	23.40	4,680	30.00	......
30,000 lb. reinf. steel	.08	2,400	.07	......
2,000 sq.ft. broken rock pavement	.13	260	.20	......
100M ft.b.m. redwood	95.00	9,500	100.00	......
300M ft. b.m. Douglas fir	85.00	25,500	88.00	......
4,000 lb. galv. bolts and nuts	.13	520	.15	......

13½ x 7½-Ft. Concrete Drain in Baltimore

WORK is starting on stormwater contract 160 of the Baltimore bureau of sewers, let to D. C. McAleer, 703 Lexington Bldg., Baltimore, on Jan. 14, 1930, for $145,309, only $623 less than the second bidder. The purpose of the work is to cover over an unsightly stream known as Moore's Run located in the northeastern section of the city. The principal portion of the contract consists of 2,600 lin.ft. of rectangular section reinforced-concrete drain ranging in size from 10½x5¼ ft. to 13½x7½ ft., as shown in the drawing. With this is combined a 21-in. sanitary sewer, the concrete around the sanitary sewer being poured in conjunction with the larger unit.

As invert lining, contractors were asked to bid on either: (1) 4½-in. vitrified-brick invert, including cement mortar, or (2) vitrified-clay liner plates, including mortar and concrete to a depth of 4½ in. below top of liner plate, which thickness is the same as that of the brick. All eight bidders planned to use liner plates. Unit prices are given of the lowest three: A, D. C. McAleer; B, Natale Martell, 4400 Vosta Ave.; C, W. H. Thompson Construction Co., Relay. Milton J. Ruark, sewerage engineer, calls attention to the low prices for excavation. "The unit bids," he says, "compare favorably with pre-war prices."



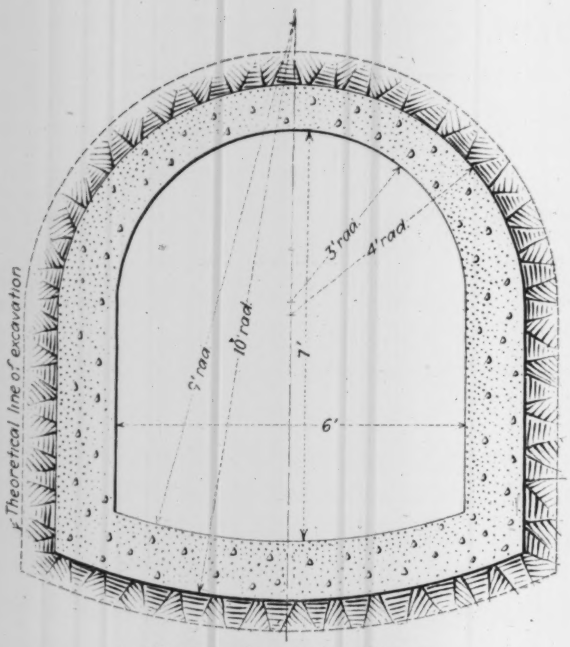
Large concrete drain with 21-in. sanitary sewer

	A	B	C
22,200 cu.yd. earth excav. above subgrade	$0.40	$0.40	$0.35
7,400 cu.yd. rock excav	3.00	3.00	2.75
150 lin.ft. earth excav. 15-in. inlet connections	1.00	.40	1.00
1,160 lin.ft. earth excav. house connections	.48	.30	[illegible]
40 cu.yd. excav. (unclassified) for test pits	.50	1.00	1.40
10 cu.yd. excav. below subgrade	2.50	2.50	2.50
10 cu.yd. gravel refilling below subgrade	6.00	5.00	3.00
410 lin.ft. hauling 36-in. R. C. pipe	.40	.20	.30
410 lin.ft. laying 36-in. R. C. pipe	.30	.20	.50
Furnishing and laying:			
360 lin.ft. 27-in. V. P. drain with P.C.M. jts.	3.00	2.80	3.00
1,905 lin.ft. 24-in. V. P. sewer and drain with P.C.M. jts.	1.60	1.65	2.00
2,125 lin.ft. 21-in. V. P. sewer with P.C.M. jts.	1.20	1.25	1.50
720 lin.ft. 18-in. V. P. sewer and drain with P.C.M. jts.	1.00	.95	1.00
224 lin.ft. 15-in. V. P. drain with P.C.M. jts.	.80	.70	.80
460 lin.ft. 10-in. V. P. sewer with P. C.M. jts.	.40	.40	.35
1,920 lin.ft. 8-in. V. P. sewer with P.C.M jts.	.25	.25	.25
150 lin.ft. 15-in. V. P. inlet connections with P.C.M. jts.	.80	.70	.80
1,420 lin.ft. 6-in. V. P. house with connections P.C.M. jts.	.18	.20	[illegible]
10 bituminous joints in house connections	.26	.10	.10
35 6-in. branches on 24-in. V. P. sewer	6.00	4.00	6.00
27 6-in. branches on 21-in. V. P. sewer	3.80	3.00	5.00
11 6-in. branches on 18-in. V. P. sewer	3.00	2.25	4.00
14 6-in. branches on 10-in. V. P. sewer	1.00	1.00	1.50
47 6-in. branches on 8-in. V. P. sewer	.85	.90	.70
1 6-in. branch on 6-in. V. P. sewer	.70	.60	.70
554 lin.ft. standard inlet, drop, snow manholes	6.00	6.00	8.00
5 lin.ft. offset manholes	3.00	3.00	4.00
16 lin.ft. type C manholes	10.00	12.00	20.00
1 27-in. V. P. connection in masonry drain	10.00	10.00	10.00
7 15-in. V. P. connections in masonry drain and manhole	2.00	3.00	4.00
8 6-in. and 8-in. V. P. connections in masonry drain and manhole	1.00	2.00	1.00
1.350 lin.ft. excavating, furnishing and laying 10-in underdrain	.40	.29	.36
1,350 lin.ft. excavating, furnishing and laying 8-in. underdrain	.35	.25	.27
1,660 lin.ft. excavating, furnishing and laying 6-in. underdrain	.15	.15	.18
16 cu.yd. ordinary brick masonry	17.00	18.00	20.00
10 cu.yd. vitrified brick masonry	18.00	20.00	22.00
3,740 cu.yd. concrete masonry, class A	9.00	9.00	9.00
2,110 cu.yd. concrete masonry, class B	7.10	7.50	8.00
146 cu.yd. concrete masonry, class C	5.80	6.00	7.00
469,000 lb. reinforcing steel	.0275	.029	.03
600 M. ft. b.m. sheeting, shoring, bracing lumber	40.00	40.00	40.00
5 M. ft. b.m. lumber in permanent foundation	45.00	45.00	45.00
5 "A" drop connection 8-in. V.P. and 10-in. V.P. sewer	10.00	5.00	10.00
3 "B" drop connection 8-in. sewer	10.00	7.00	15.00
500 cu.yd. furnishing, placing cinder topping	.80	1.00	1.00
22 cu.yd. furnishing, placing granite block masonry	30.00	32.00	50.00
7 cu.yd. furnishing, placing granite block curbing	40.00	65.00	50.00
Furnishing, placing 22½-ft. of 27-in. I-beam, complete in place (lump sum)	100.00	200.00	100.00
118 sq.yd. rubble masonry slope paving in P.C.M.	2.00	3.00	.30
42,000 sq.ft. invert lining	.25	.23	.25
Totals	$145,309	$145,932	$148,800

7-Ft. Concrete Sewer in Tunnel at Ottawa

BOLTON St. section of the King Edward Ave. sewer in Ottawa, Canada, from the Ottawa River to Cathcart Sq., consists of 2,430 ft. of 7-ft. concrete sewer in tunnel. Contract was let in January, 1931, to McDougall Bros., Besserer St., for $122,824. Of this price, 40½ per cent was for the concrete sewer and 54½ per cent for 7,050 cu.yd. of rock tunnel excavation. Time of completion is five months, with a daily penalty of $50. Concrete is class B, 1 : 2 : 4. Volume of concrete per linear foot is 0.923 cu.yd.. Excavation per linear foot is 2.9 cu.yd.

Unit prices are given for the three tenders received: A, McDougall Bros.; B, McLaughlin Bros.; C, Grant Bros. This contract is for the lower section of 4,850-ft. of 84-in. sewer. The upper section is to be constructed of 84-in. precast concrete pipe by day labor. The pipe is under contract at a price of $14.20 per foot delivered on the job.



7-ft. sewer in tunnel at Ottawa

Andrew Macallum is the commissioner of public works. A local bylaw sets wages at 75c. for cement finishers and mixer operators; 60c. for drillrunners, 70c. for compressor operators, 50c. for common labor.

	A	B	C
2,430 ft. conc. sewer	$20.45	$12.00	$16.65
7,050 cu.yd. rock tunnel excav	9.50	13.41	15.25
320 cu.yd. rock excav. in shafts	10.00	11.35	12.00
1 drop shaft	1,580.00	662.50	1,500.00
5 manholes	275.00	140.00	420.00
	$122,823.50	$128,965.00	$155,412.50

◆

Four Steel Trusses Over Cedar River at Waterloo, Iowa

Work is proceeding on a steel highway bridge over the Cedar River at Waterloo, Iowa, for which contract was let Dec. 29, 1930, for $81,455. The structure consists of four truss spans 151½ ft. long, with two approach spans at each end. Total length out to out is 758 ft. Each approach is built on a vertical curve rising from El. 97.22 at the extreme end to El. 98.42 where it meets the grade of the bridge proper. Clear roadway is 24 ft., with a 5-ft. sidewalk on either side. Clearances are 6 ft. between grade line and high water, 16½ ft. to normal water level, 20 ft. to streambed. Material is dirt and muck to the bottom of the concrete piers, El. 66, with sand and gravel below. Materials for the whole job include 598 cu.yd. foundation concrete and 809 cu.yd. superstructure concrete, 212,405 lb. reinforcing, 870,024 lb. structural steel, 1,894 cu.yd. excavation.

Seven lump sum bids were received, ranging from $81,455 to $103,486 and averaging $91,400. Two bids were for $90,000. Unit prices covering extras are given herewith for the lowest three bidders: A, A. Olson Construction Co., Waterloo (contract), $81,455; B, The Widell Co., Mankato, Minn.; C, Miller-Taylor Construction Co., Waterloo.

	A	B	C
10 cu.yd. substructure conc	$28.00	$15.00	$30.00
5 cu.yd. superstructure conc	24.00	22.00	15.00
5 cu.yd. railing conc	30.00	30.00	25.00
100 lb. extra reinf. bars	.04	.04	.05
100 lb. extra structural steel	.06½	.05¾	.10
10 cu.yd. wet excav	20.00	5.00	.06
100 ft. foundation piles in place	.90	.50	1.00

◆

Steel Highway Bridge Over James River

Virginia department of highways is building a steel bridge over the James River near Lick Run consisting of six 50-ft. steel beam spans and three 105-ft. low steel truss spans. The concrete deck has a 24-ft. roadway with capacity for two 15-ton trucks passing. Length is 632 ft. 2½ in. end to end of slab. Substructure work consists of eight piers and two abutments, with footings.

Fourteen bids were received Nov. 18, 1930, from thirteen contractors in Virginia and one in North Carolina. Unit prices are given of the lowest three: A, Blount & Hayman, Brodnax, $46,261; B, M. S. Hudgins, Roanoke, $46,908; C, Alley Construction Co., Bristol, $47,069. Average of the fourteen bids is $50,867. Contract was let to Blount & Hayman at their price plus 10 per cent, contract price $50,887. Time to complete is 180 days.

Superstructure	A	B	C
457.4 cu.yd. class A concrete	$19.00	$18.00	$19.50
75,880 lb. reinforcing steel	.045	.04	.04
Substructure			
329.3 cu.yd. class A concrete	$19.00	$22.00	$19.50
27,520 lb. reinforcing steel	.045	.045	.04
237 cu.yd. dry excavation	1.50	1.50	15.00
27 cu.yd. wet excavation	15.00	10.00	1.00

◆

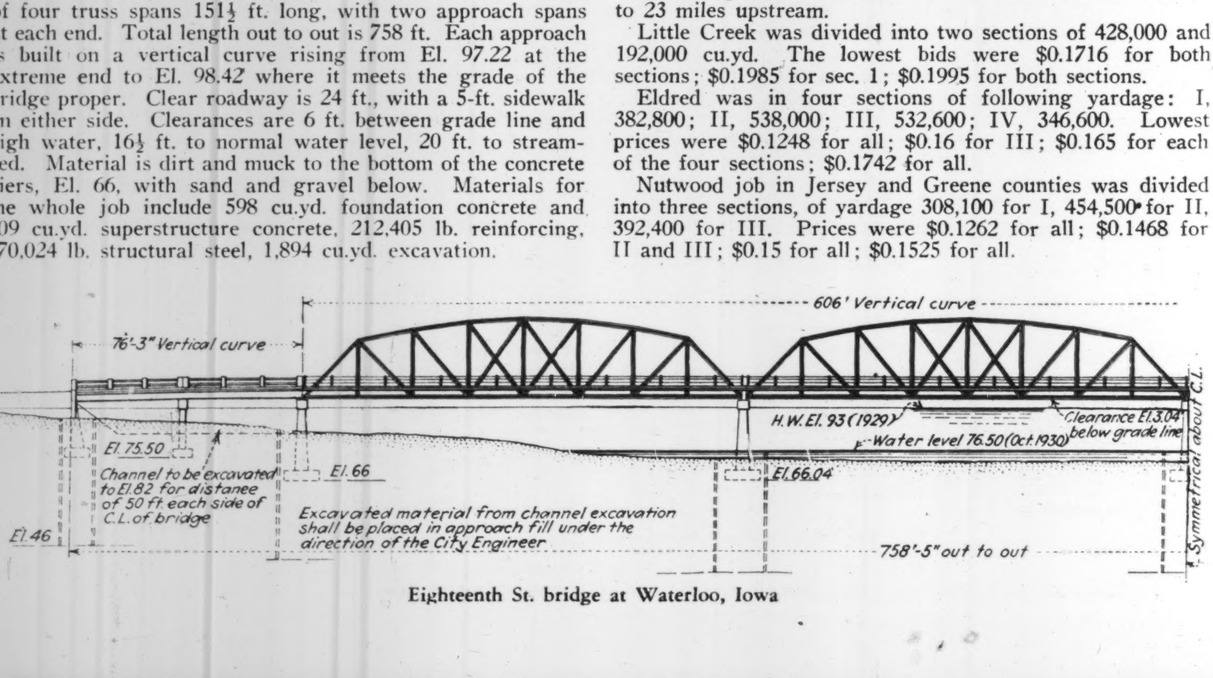
Three Levee Jobs on the Illinois River

Three levee enlargement jobs totaling 3,575,000 cu.yd. are under way in Brown, Greene and Jersey counties along the Illinois River in Illinois. Material is taken from standard riverside borrowpits or from riverbed. The first job is in Little Creek drainage district 78 miles from the mouth of the river. The second is in Eldred district 24 to 32 miles upstream. The third is in Nutwood district 15 to 23 miles upstream.

Little Creek was divided into two sections of 428,000 and 192,000 cu.yd. The lowest bids were $0.1716 for both sections; $0.1985 for sec. 1; $0.1995 for both sections.

Eldred was in four sections of following yardage: I, 382,800; II, 538,000; III, 532,600; IV, 346,600. Lowest prices were $0.1248 for all; $0.16 for III; $0.165 for each of the four sections; $0.1742 for all.

Nutwood job in Jersey and Greene counties was divided into three sections, of yardage 308,100 for I, 454,500 for II, 392,400 for III. Prices were $0.1262 for all; $0.1468 for II and III; $0.15 for all; $0.1525 for all.


606' Vertical curve
76'-3" Vertical curve
H.W. El. 93 (1929)
Clearance El. 3.04' below grade line
Water level 76.50 (Oct. 1930)
El. 75.50
Channel to be excavated to El. 82 for distance of 50 ft. each side of C.L. of bridge
El. 66
El. 66.04
El. 46
Excavated material from channel excavation shall be placed in approach fill under the direction of the City Engineer
758'-5" out to out
Symmetrical about C.L.

Eighteenth St. bridge at Waterloo, Iowa

CONSTRUCTION NEWS

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Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue.

Location	*Project*	*Cost*	*Status*
Buildings			
Chicago	Apartment	$1,500,000	Contract
Betterton (Md.)	Hotel	1,000,000	Contract
Minneapolis	Club hotel	1,000,000	Proposed
New York	Apartment	2,000,000	Day labor and separate contract
New York	Apartment	1,000,000	Day labor and separate contract
Cambridge (Mass.)	Chapel	1,000,000	Proposed
New York	Loft and storage	1,000,000	Contract
Chicago	Office	5,000,000	Proposed
New York	Office	1,000,000	Bids asked
New York	Office	15,000,000	Proposed
Pasadena (Calif.)	Junior High School	1,000,000	Proposed
New York	College	4,000,000	Proposed
Nashville	School	1,000,000	Proposed
Charlottesville (Va.)	University	1,000,000	Bids asked
Oakland (Calif.)	Store	1,000,000	Contract
Cambridge	Memorial	1,000,000	Proposed
Philadelphia	Union Station	5,000,000	Proposed
Waterworks			
Louisville	Reservoir, etc	1,250,000	Proposed
Baltimore	Water tunnel	1,145,000	Contract
Bridges			
New Orleans	Bridge	16,000,000	Proposed
St. Louis	Bridge	5,000,000	Proposed
Seattle	Bridge	3,000,000	Proposed
Unclassified			
New York	Pier	10,000,000	Proposed
Wyoming and Nebraska	Pipe line	1,000,000	Bids asked
Federal Government			
Alma (Wis.)	Dams and lock	3,000,000	Proposed
Factories and Mills			
Kingsport (Tenn.)	Yarn mill	1,000,000	Contract

WATERWORKS

PROPOSED WORK

Conn., Colchester—Town, A. T. Van Cleven, chn. com., preliminary plans waterworks. $60,000. G. L. Bilderbeck, State St., New London, consult. engr. Noted Dec. 11.

Ia., Des Moines — Des Moines Municipal Water Plant, C. I. Dunn, mgr., preliminary plans main extensions, fire hydrants, valves, boxes. $250,000. J. M. Tippee, City Hall, engr.

Ill., Millstadt—Preliminary plans waterworks, distribution system. Election $59,000 for same. Russell & Axon, 6200 Easton Ave., St. Louis, Mo., and McDaniel Bldg., Springfield, Mo., engrs.

Ky., Louisville—Louisville Water Co., Inc., 435 South 3rd St., J. Chambers, ch. engr., 30 m.g. concrete reservoir, and 6 mi. 48 and 60 in. pipe. $1,250,000. Alvord, Burdick & Howson, 20 North Wacker Dr., Chicago, Ill., engrs.

N. J., Fair Lawn—Bd. Boro Council, Boro Hall, 6 in. mains in Columbia Heights Sect. $15,000. McClave & McClave, 600 Gorge Rd., Cliffside Park, boro engrs.

N. J., Oakland—Bd. Boro Council, Boro Hall, preliminary plans water supply, incl. wells, on Long Hill and laying mains throughout streets. $15,000 or more. J. M. Demarest, boro engr. Noted Dec. 4.

R. I., Tiverton—Town, Bd. Selectmen, extending mains. Engineer not selected.

Tex., Kilgore—City, c/o R. Laird, waterworks, sewerage system. $100,000.

Wis., Racine—City water pumping station. $500,000. Alvord, Burdick & Howson, 20 North Wacker Dr,. Chicago, Ill., engrs.

Ont., Toronto—For 2½ mi. 36 in. c.i. main in College St. west of Bathurst St. $471,792. R. C. Harris, City Hall, engr.

BIDS ASKED

N. J., Hammonton—See "Contracts Awarded."

N. Y., Elmira—Mar. 16, by Water Bd., City Hall, 1½ m.g. covered concrete reservoir; adv. E.N.-R. Feb. 6.

N. Y., Goshen—Village bids about May 1, general contract water supply reservoir. H. B. Cleveland, 225 Bway., New York, engr. Noted Jan. 15.

N. D., Wahpeton—Mar. 2, by City, A. H. Miller, aud., drilling wells. G. M. Orr & Co., 408 Baker Bldg., Minneapolis, Minn., engrs. Noted Dec. 9 Daily.

O., Canton—Bd. Control, bids about Apr. 16, sinking several wells, enlarging water pumping facilities. $160,000. W. E. Sarver, city engr.

Wash., Bellingham—City Council taking bids South Side Water Impvt., incl. diverting 4 live streams into Lake Padden, 2.5 mi. pipe line, to supply lake with at least 1,500,000 gal. water daily. $50,000. J. C. Hills, Bellingham, engr.

Wash., Seattle—See "Streets and Roads."

CONTRACTS AWARDED

Calif., Glendale — City Council, to Pacific Pipe & Supply Co., 1002 Santa Fe Ave., Los Angeles, six 30 in. hub end gate valves at $279.39 each, one 24 in. at $173.95, for 30 in. flanger $297.39 each, two 20 in. $147 each.

Ind., Indianapolis — Indianapolis Water Co., 113 Monument Circle, 1½ m.g. tank on 100 ft. tower, at Irvington, to Chicago Bridge & Iron Co., 37 West Van Buren St., Chicago, Ill., $167,449.

Kan., Neodesha—S. G. Hamilton, city clk., general contract filtration plant improvements and filters, to Standard Paving Co., 2119 East 11th St., Tulsa, Okla., $47,457 and $12,800 respectively; tower and tanks, to Chicago Bridge & Iron Wks., 37 West Van Buren St., Chicago, Ill., $3,450. Grand total $63,707. Noted Jan. 29.

Ky., Cloverport—O. E. Ferguson, mayor, complete waterworks, incl. materials, wells, pumps, reservoir, hydrants, to Mrs. C. W. Farley, 450 South Park Rd., La Grange, Ill., $60,000. Est. $55,000. Contractor buys all material. Noted Jan. 15.

Md., Baltimore—Bureau Water Supply, construction, installing Montebello-Druid Conduit from Mt. Vernon Pumping Station to Montebello filtration-plant, Park Grove from Tivoly Ave. to Alameda Blvd., incl. 14,000 lin. ft. 84 in. reincon. pressure pipe conduit for new filtration water reservoir, dry rubble, backfill, electric wiring, to Whiting Turner Contg. Co., Stewart Bldg., $1,145,878. Noted Jan. 29.

N. J., Hammonton—Bd. Town Council, Town Hall, mains in Main Rd., Bway., Pratt, Liberty, Peach, Vine and Grape Sts., day labor. $27,000. J. A. Baker, town engr. Noted Feb. 12.

N. Y., New York—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., mains in Edgecombe and Madison Aves., to Dietz Fallert Co., 26 Court St., Brooklyn, $141,999, in Ampere, Buhre, Chesborough Aves. to Melrose Constr. Co., 103 East 125th St., $5,600; in Brady, Fink, Inwood, Mayflower, Aves., to Sareno Contg. Co., 1957 Colden Ave., $8,325. Grand total $155,920. Noted Feb. 5.

SEWERS

PROPOSED WORK

Ark., Forrest City—City postponed indefinitely taking bids extensions to Forrest City Special Sewer Impvt. Dist. in northern and western sections. $25,000. Ford & McCrea, Gazette Bldg., Little Rock, engrs. Noted Aug. 28.

Conn., Ridgefield—Extending sewage treatment works. $95,000. T. F. Bowe, 110 William St., New York, consult. engr.

Fla., Gainesville—City, W. A. Ford, mgr., complete new sewage disposal plant. $45,000.

N. J., Beachwood — Bd. Boro Comrs., Boro Hall, will not build sewage disposal plant. $25,000. Project abandoned. Noted Oct. 23.

N. J., Hasbrouck Heights—Bd. Boro Council. Municipal Bldg., renovating, altering sewage disposal plant. $25,000. Project in abeyance. Noted Jan. 22.

N. J., Keyport—Bd. Boro Council, Boro Hall, enlarging sewage disposal system. $25,000. Project in abeyance. Noted Dec. 11.

N. J., South Amboy — Town Council, Town Hall, sketches storm water sewer in Feltus and John Sts. $25,000. A. T. McMichael, Post Office Bldg., town engr.

N. Y., New Paltz—Preliminary studies sewerage system, sewage treatment plant. T. F. Bowe, 110 William St., New York, consult. engr.

O., East Cleveland (br. Cleveland)—Sewers in Nine Mile Creek and tributary channels, $66,000; reconstructing east branch of Dugway Brook, $75,000. M. Garnett, City Hall, engr.

Tex., Kilgore—See "Waterworks."

Ont., Toronto — City, rein.-con. addition to sewage disposal plant, activated sludge system, serving North Toronto Dist. $500,000. R. C. Harris, City Hall, engr.

BIDS ASKED

Calif., Los Angeles—Mar. 4, by Bd. P. Wks., City Hall, Sect. 2-San Pedro Intercepting Sewer **(a)** Type 1, 6,333 lin.ft. 33 in. vitr. clay sewer **(b)** Type 2, 6,333 lin.ft. 33 in. precast rein.-con. sewer with vitr. clay lining blocks, incl. tunnels, curves, structures.

Md., Baltimore—Mar. 4, by Bd. Awards, sanitary sewers in Sanitary Contr. 268, incl. 5,260 lin.ft. 8 in. vitr. sewer, 2,375 lin.ft. 6 in. house connections, 1,100 lin.ft. 6 in. underdrain, 1,000 lin.ft. 4 in. underdrain. M. J. Ruark, Federal Reserve Bank Bldg., sewerage engr.

N. J., Allenwood — Bd. Boro Council, Boro Hall, bids about May 1, 1 story, steel, concrete sewage disposal plant. $50,000. L. Cubberly, 210 Bway., Long Branch, archt. Noted Feb. 12.

O., Medina—Mar. 4, by Village, sewage disposal plant. $135,000. G. B. Gascoigne, Leader Bldg., Cleveland, engr. Noted Nov. 20.

Pa., Etna—Mar. 9, by J. C. Armstrong, boro secy., 23 Locust St., 15,500 lin.ft. 6- to 36-in. concrete or terra cotta pipe, 70 concrete, brick manholes extending along Pike Creek from Alle-

See proposal advertising on page 116

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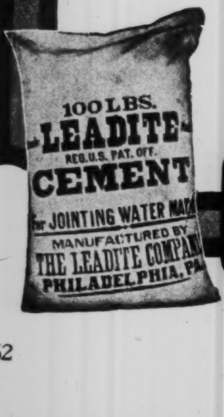
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Sewers (Continued)

gheny River to City. S. H. Burns, Etna, boro engr. F. G. Ross, 309 4th Ave., Pittsburgh, engr. $150,000.

Pa., Phila.—Mar. 11, by Dpt. P. Wks., Bureau Eng. & Surveys, City Hall Annex, A. Murdock, dir., main sewer in Bells Mill Rd. between Wissahickon Ave. and Perkiomen Turnpike. Noted Jan. 1.

Wash., Seattle—See "Streets and Roads."

Wis., Milwaukee—Mar. 9, by Metropolitan Sewerage Comn., furnishing, erecting 2 motors, two 2,500 gal. centrifugal pumps, for sewage booster station, Port Washington Rd. J. L. Ferebee, ch. engr.

CONTRACTS AWARDED

Ill., Itasca — Sanitary sewerage, treatment plant, incl. 6- to 21-in. vitr. tile pipe, pumping station, tank, sludge bed, filter bed, to Gjellefeld Constr. Co., Forest City, Ia., $136,075.

Kan., Wichita—C. C. Ellis, city clk., mechanical equipment for complete disposal plant, incl. screens, clarifiers, to Link Belt Co., 300 West Pershing Rd., Chicago, Ill.; digesters, to Harding Co., York, Pa. Noted Dec. 11.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway, sewers in 45th Dr. and Oceania Ave., to Kennedy & Smith, Inc., Bradford Ave., Flushing, $64,876 and $48,300 respectively. Noted Feb. 5.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., sewers in 92nd Ave. and 92nd Rd., to P. Ambrosio, 674 Glenmore Ave., Brooklyn, $116 and $3,177 respectively. Noted Jan. 15.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., sewers in 125th St., to A. Capasso, 865 Liberty Ave., Brooklyn, $3,056; Pitkin Ave., to P. Ambrosia, 674 Glenmore Ave., Brooklyn, $2,174; Quencer Rd., to Matarazzo & Yondola, 1163 61st St., Brooklyn, $2,635. Grand total $7,865. Noted Feb. 12.

N. Y., St. George—J. A. Lynch, pres. Richmond Boro, Boro Hall, sanitary sewers in Cleveland Ave., to Trifoglio Constr. Co., 349 Carey Ave., West New Brighton, $73,363. Noted Jan. 22.

N. C., Greensboro—Proximity Mfg. Co., sewage facilities for textile villages, to Tucker & Laxton, Independence Bldg., Charlotte. Est. $40,000-$250,000.

Va., Richmond—Dpt. P. Wks., City Hall, North Richmond Sewer, incl. 5,000 lin.ft. 6- to 18-in. vitr. pipe, Highland Park Sewer, incl. 8,100 lin.ft. 12- to 24-in. vitr. pipe and 27- to 54-in. precast rein.-con. pipe, to Hughes & Keegan, Real Estate Exch. Bldg., $8,295; furnishing, delivering 1,360 lin.ft. 27 in. and 370 lin.ft. 30 in. precast concrete pipe, to Concrete Pipe & Products Co., Central Natl. Bank Bldg.; 996 lin.ft. 33 in., 40 lin.ft. 36 in., 1,437 lin.ft. 42 in. and 358 lin.ft. 54 in. precast concrete pipe, to Gray Concrete Pipe Co, Thomasville, N. C. Noted Jan. 29.

Wis., Milwaukee — City, excavating, piling, concrete and masonry for 2 story, 57 x 63 ft. high pressure pumping station, South 1st St., to S. Czoplewski & Sons Co., Inc., 2136 South 7th St., $31,328; carpentry work, to F. Luenzmann, 1912 Highland Ave., $232; cut stone, to J. Kies, 5421 State St., $581; structure, ornamental iron, to W. Eichfeld & Son, 27th St., $2,098; plumbing, sewer, gas, to G. Arciszewski, 728 Becher St., $3,278; power piping, to S. V. Hanley, 209 Horwell St., $5,990. Grand total $43,506.

BRIDGES

PROPOSED WORK

Conn., Hartford—City, R. N. Clark, engr., 854 ft. span concrete, steel bridge over Connecticut River, Southeastern Dist. Project in abeyance until late fall. C. W. Hudson, 15 Park Row, New York, engr. Noted Dec. 25, under "Connecticut."

Ill., Chicago—See "Sewers."

Ind., Goshen—Bd. Comrs. Elkhart Co., Middlebury Street Bridge 200 ft. span, steel girder. $80,000. W. S. Moore, South Bend, engr.

Ind., Muncie—Bd. Comrs. Delaware Co. rein.-con. arch bridge over White River, at Wysor St. $100,000. J. Watson, Muncie, engr.

La., New Orleans—Public Belt R.R. Comn., City Hall Annex, bids in June or later substructure and superstructure railroad and vehicle bridge over Mississippi River, near here. $16,000,000. Modjeski, Masters & Chase, 121 East 38th St., New York, engrs.

Michigan — H. G. Rose, div. bridge engr., Grand Rapids, cancelled bids to have been opened Feb. 23, M Br. 1 of 34-6-3, Contrs. 2 and 3, 2 rein.-con. abutments, steel deck girder, concrete flooring, surfacing, Ionia Co., for State Hy. Comn., Lansing. Noted Feb. 19.

Mo., St. Louis—City, c/o Bd. P. Serv., City Hall, preliminary plans rein.-con. bridge to have 3 spans, 80 ft. long over Maline Creek, Riverview Dr. $60,000. L. R. Bowen, city engr.

Mo., St. Louis — H. C. Brenner Realty & Finance Corp., 2801 Chippewa St., soon takes bids substructure rein.-con., steel bridge with lower deck for railroads and upper deck for vehicles and pedestrians across Mississippi River between Osage and Cherokee Sts. $5,000,000.

N. H., Milford—State and Town, widening Stone Bridge, 2 spans, 49 and 50 ft., concrete fill, granite arches. To exceed $25,000. Hy. Dpt., State House, Concord, engrs.

N. J., Point Pleasant—Bd. Freeholders Ocean Co., Court House, Toms River, steel, timber bridge with swinging draw span over Beaver Dam Creek, connecting West Point Pleasant with Metedeconk (swing draw will be used that is now in use on Mantoloking Bridge). $25,000 or more. Project in abeyance. H. C. Shinn, Municipal Bldg., Lakewood, co. engr. Noted Feb. 12.

New York and New Jersey—Syndicate, c/o F. A. Burdett & Co., consult. engrs., 25 West 45th St., New York, L. C. Findley, in charge, associated with Raymond Concrete Pile Co., 140 Cedar St., New York, who will be the contractor, are working up estimates and making plans for bridge approximately 4 mi. long, 1,000 ft. span over Raritan Bay between Staten Island, N. Y., and Union Beach, N. J. $15,000,000.

N. Y., New Brunswick—Bd. Freeholders Middlesex Co., Court House, new bridge or altering present bridge over Green Brook, at East Main St. $25,000. W. F. Buchanan, 280 Hobart St., Perth Amboy, co. engr.

Tex., New Braunfels—For 110 ft. concrete bridge, 36 ft., over Comal River. $35,000 bonds voted for same. Terrell Bartlett Engineers, Gunter Bldg., San Antonio, engrs. Noted Jan. 22.

Wash., Seattle—Seattle Toll Bridge Co., W. H. McCurdy, pres., 3,200 ft. concrete toll bridge with central draw span for deep water traffic across Lake Washington, from Seward Park to Mercer Island. $3,000,000.

BIDS ASKED

California — Mar. 11, by State Hy. Comn., Sacramento, one 48 ft. and four 34 ft. span rein.-con. girder bridge over Atchison, Topeka & Sante Fe R.R., 2 mi. east of Essex, San Bernardino Co. C. H. Purcell, hy. engr.

Calif., San Francisco — Mar. 25 (extended date), by S. J. Hester, secy. Bd. P. Wks., City Hall, 140 ft. span single leaf bascule bridge 80 ft. wide, 103 ft. between fenders 6 ft. sidewalks, 2 street railway tracks, belt railroad track, also vehicular traffic over Islais Creek channel at 3rd St. $400,000. M. M. O'Shaughnessy, city engr. Noted Feb. 19.

Ind., Michigan City—Mar. 20 (extended date), by Bd. Comrs. La Porte Co. (La Porte), bascule bridge over harbor. $300,000. E. L. Alexander, La Porte, engr.; adv. E. N.-R. Feb. 26.

Louisiana — Mar. 17, by State Hy. Comn., Baton Rouge, bridges over Company Canal at Westwego, Jefferson Parish; over Ouachita River at Harrisonburg, Catahoula Parish. H. B. Henderlite, hy. engr.; adv. E. N.-R. Feb. 26.

Louisiana—See "Streets and Roads."

Maryland—Mar. 10, by State Roads Comn., G. C. Uhl, chn., Baltimore, steel, concrete bridge, Contr. Ce-97-23, Cecil Co.; double span arch bridge, Contr. P-143-35, Prince George's Co.; adv. E. N.-R. Feb. 26.

New Jersey—Mar. 9, by State Hy. Comn., Trenton, 5 bridges on Route 4, Sect. 3, at River Rd., Margaret St., Kueen Anne Rd., Lafayette St. and Garrison Ave., Bergen Co. A. L. Grover, ch. engr.

N. Y., Yorktown—Mar. 11, by Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, stone faced concrete bridge carrying Taconic Parkway connection over Bronx Parkway extension, and 2 adjacent river bridges, Contr. 340. J. Downer, ch. engr.; adv. E. N.-R. Feb. 26.

Pa., Reading — Mar. 13, at office S. H. Rothermel, aud. Berks Co., at Court House, Buttonwood Street Bridge over Schuylkill River. L. F. Christman, Ganster Bldg., 5th and Walnut Sts., co. engr. Concrete-Steel Eng. Co., 1902 Park Row Bldg., New York, designing engrs.; adv. E. N.-R. Feb. 26. Noted Dec. 25.

Wisconsin — Mar. 4, by State and Grant, Crawford and Lafayette Counties, constructing Brooklyn Bridge, on Cassville-North Andover Rd., S.T.H. 133, S.A.P. 9364, Grant Co. — bridges on Mount Sterling-Ferryville Rd., S.T.H. 131, S.A.P. 9297A, and Turk Bridge, on Boscobel-Readstown Rd., S.T.H. 27, S.A.P. 9194, both Crawford Co. — bridges on Hazzards Corners-Darlington Rd. and Stavers Corners-Belmont Rd.; on Warren Co.-Gratiot Rd. and Wiota Rd., S.T.H. 81, Projects 9393 to 9410; and Shullsburg-Hicks Corners Rd. and Darlington-Lamont Rd., S.T.H. 20 and 14, S.A.P. 9397 and 9398, all foregoing Lafayette Co.

CONTRACTS AWARDED

Indiana — State Hy. Comn., Indianapolis, 3 rein.-con., steel bridges in Greene Co., to M. and P. Contract Co., Rockport, $23,965 est. $27,608 — 1 rein.-con. girder bridge, Monroe Co., and 1 rein.-con., steel arch bridge Boone Co., to A. G. Ryan Contract Co., Chrisney, $8,363 and $12,732 respectively, est. $11,197 and $15,706 respectively — 3 rein.-con., steel arch bridges, Fayette Co., to Billiter, Miller & McClure, Covington, Ky., $28,293 est. $37,337 —1 rein.-con., steel truss bridge, Jennings Co., to H. Hicks & Son, North Vernon, $39,881 est. $50,771. Grand total $113,234. Noted Jan. 15.

Kan., Wellington—Sumner Co., at office J. A. Alexander, clk., three 100 ft. steel truss span bridge, 20 ft. roadway, to O. T. Tyler Constr. Co., Blackwell, Okla., $22,855. Noted Feb. 5.

Louisiana—State Hy. Comn., Baton Rouge, bridge over Old River at Montrose, Natchitoches Parish, to Austin Bridge Co., 1813 Clarence St., Dallas, Tex., $37,993; bridge over Gross Tete River, Point Coupee Parish, to W. H. Groome & Son, Covington, $43,924. Noted Jan. 22.

Louisiana — State Hy. Comn., Baton Rouge, overpass over Texas & Pacific R.R., Avoyelles Parish, to Austin Bridge Co., 1813 Clarence St., Dallas, Tex., $21,484 — bridges over Little Tensas Bayou between Lake Providence and Gassoway, East Carroll Parish, to Midland Constr. Co., Clarksdale, Miss., $13,041—over Ranch Canal between Houma and Chauvin, Terrebonne Parish, to C. C. Duplantis, Houma, $6,587. Grand total $41,112.

Virginia—State Hy. Comn., Richmond, two 45 ft. rein.-con. beam span and one 75 ft. low steel truss span bridge over Snake Creek, Route 12, Project 506-B-5 and three 30 ft. beam span and one 90 ft. low steel truss span bridge over Big Reed Island Creek, Route 12, Project F-506-B-4, both Carroll Co., to Blount & Hayman, Brodnax, $15,093 and $14,366 respectively—40 ft. span rein.-con. beam bridge over Juduth Creek, Bedford Co., to J. I. Hicks & Bros., Evington, $4,799. Grand total $34,258. Noted Jan. 29 under "Streets and Roads."

Wisconsin—State Hy. Comn., Capitol Annex, Madison, constructing Spring Green Bridge, Job M15 and Boscobel Slough Bridge Job M79, to Gaggin & Gehri, Fond du Lac, $8,902 and $6,629 respectively—Portage Bridge, Job M2, to A. O. Clark, Wausau, $9,825—Red Cedar Bridge, Job M37, to Alfred Brown & Co., Chippewa Falls, $7,352—and McGilvery Bridge, Job to E. G. Bigham, Winona, $4,200. Grand total $36,908. Noted Jan. 29.

STREETS AND ROADS

BIDS ASKED

California—Mar. 11, by C. H. Purcell, engr. State Hy. Comn., Sacramento, grading 29.8 mi. Grapevine Station-Bakersfield Rd.; bituminous treated crushed gravel or stone surfacing shoulders, both Kern Co. — grading, concrete surfacing 0.9 mi. overhead crossing approaches at Galivan, Orange Co.—6.9 mi. Holtville-East High Line Canal Rd., Imperial Co.—undergrade crossing under Southern Pacific R.R., at New England Mills, Placer Co., incl. 2 concrete abutments, with wing walls, grading, bituminous treated crushed gravel or stone surfacing 1,000 lin.ft. roadway.

California—See "Grade Crossings."

Calif., Los Angeles—Mar. 2, by Bd. Supervs. Los Angeles Co., grading, 8-6-8 in. compressed concrete paving 475,000 sq.ft., 1½ in. oil macadam paving 155,000 sq.ft., 5 in. disintegrated rock and old macadam rock base paving 518,000 sq.ft. County Impvt. 952, Pomona Blvd.

Calif., Los Angeles—Bd. P. Wks., City Hall, taking new bids grading, curbing, sidewalks, 6 in. concrete paving 238,000 sq.ft. 112th St. and Bellhaven St. Impvt. Dist.

Calif., Palo Alto—City Council cancelled bids to have been opened about Feb. 9, grading, curbing, sidewalks, 6 in. concrete paving 350,000 sq.ft. Palo Alto Ave., Hale St., et al. Will readvertise. Noted Jan. 29.

Connecticut—Mar. 2, by J. A. Macdonald, state hy. comr., Hartford, grading, drainage structures 28,500 ft. Bolton Notch-Columbia Rd., Andover—10,650 ft. Marlboro-East Hampton Rd., Marlboro and East Hampton—rein. con. paving 25,814 ft. Payne's Corner-Naugatuck Rd., Bethany and Woodbridge—11,850 ft. Middletown-Saybrook Rd., Chester and Haddam—22,404 ft. Danbury-Brewster Rd., Danbury—12,235 ft. Norwalk-New Canaan Rd., New Canaan and Norwalk—28,999 ft. Putnam-Rhode Island Rd., Putnam—21,820 ft. Torrington-Winsted Rd., Winchester and Torrington—bituminous macadam on trap rock paving 2,493 ft. Groton—trap rock water-bound macadam paving 6,100 ft. Rock Landing Rd., Haddam—concrete encased I-beam bridge 1,385 ft. bituminous macadam approaches over Farmington River, Colebrook—8 x 10 ft. concrete box culvert, 1,245 ft. trap rock water-bound macadam paving appoaches, Lake Quonnipaug, Guilford—concrete encased I-beam bridge, rein.-con. paving over Hockanum River, Manchester—136 ft. span concrete encased I-beam bridge, 2,035 ft. rein.-con. paving approaches over Natchaug River, Windham—24 ft. span concrete girder bridge, 500 ft. grading on approaches over Oyster River, Old Saybrook.

D. C., Wash.—Mar. 22, by District Comrs., District Bldg., paving.

D. C., Wash.—Apr. 20, by District Comrs., District Bldg., paving.

Ill., Robinson—Mar. 2 (extended date), at office Clerk Crawford Co., traffic bound gravel surfacing 22,879 ft. State Aid Route 14, Sect. 2, 22 ft. wide, with two 6 ft. earth shoulders—gravel surfacing 10,300 ft. State Aid Route 13, Sect. 3, 18 ft. wide, with two 6 ft. earth shoulders—5,100 ft. State Aid Route, Sect. 3-W, 18 ft. wide with two 6 ft. earth shoulders. L. F. Walker, county supt., hys. Noted Feb. 5.

Ind., Auburn—Mar 3, by Bd. Comrs. DeKalb Co., concrete surfacing 21,790 ft. Waterloo-Hamilton Rd. $63,735. F. E. Lyon, Auburn, aud.

Ind., Goshen—Mar. 1, by Bd. Comrs. Elkhart Co., concrete surfacing 3 mi. X-4 Rd., 18 ft. $68,000. B. Wise, Goshen, engr.

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Streets and Roads (Continued)

Ind., Marion—Mar. 1, by Bd. Comrs. Grant Co., concrete surfacing 2 mi. Johnson Rd., 20 ft. $50,000. W. Wilson, Marion, engr.

Ind., Newcastle—Mar. 1, by Bd. Comrs. Henry Co., asphaltic macadam surfacing 69,327 sq.yd. Wilholt Rd. $109,236. J. R. Leakey, Newcastle, engr.

Louisiana — Mar. 17, by State Hy. Comn., Baton Rouge, grading, drainage structures 11 mi. Archie-Center Point Hy., La Salle and Rapides Parishes—9.4 mi. Grand Ecore-Winfield Hy., Natchitoches and Winn Parishes—10 mi. Sterlington-Farmerville Rd., Ouachita and Union Parishes — 9.5 mi. Many-Zwolle Hy., Sabine Parish — 10 mi. Farmerville-Sterlington Hy., Union Parish — amiesite surfacing 10.9 mi. Jonesville Hy., La Salle and Catahoula Parishes —asphalt surfacing 13 mi. Oakville-Myrtle Grove Hy.—10 mi. Jesuit Bend-Junior Hy., both Plaquemines Parish — 10 mi. Poydras-Delcour Hy., Plaquemines and St. Bernard Parishes—10.7 mi. Hammond-Covington Hy., Tangipahoa Parish — 15 mi. Robeline-Natchitoches Hy., Natchitoches Parish — 15 mi. Many-Robeline Hy., Sabine and Natchitoches Parishes—20 mi. Florien-Hymes Hy., Sabine and Vernon Parishes — 10.7 mi. Hammond-Covington Hy., St. Tammany and Tangipahoa Parishes—grading, drainage structures, concrete surfacing 9.8 mi. Plaquemine-White Castle Hy., Iberville Parish—concrete surfacing 10 mi. Oak Grove-Darnell Hy., West Carroll Parish—9.5 mi. New Roads-Oscar Hy., Pointe Coupee Parish—10.32 mi. Chase-Wisner Hy., Franklin Parish—19.6 mi. Monroe-Corey Hy., Ouachita and Caldwell Parishes—10 mi. Mansfield-Benson Hy., De Soto Parish—8.2 mi. Wisner-Sicily Hy., Catahoula and Franklin Parishes—14 mi. Bernice-Junction City Hy., Union and Claiborne Parishes—9.6 mi. Natchitoches Hy., Natchitoches Parish—8.6 mi. Mandeville-Slidell Hy., St. Tammany Parish —10 mi. Lake Charles-Gillis Hy., Calcasieu Parish — 8.6 mi. Abbeville-Erath Hy., Vermillion and Iberia Parishes—11.8 mi. Swords-Eunice Hy., St. Landry Parish — bridge over Lake Borgne at Violet, St. Bernard Parish. H. B. Henderlite, hy. engr.

Maine—Mar. 3, by State Hy. Dpt., Augusta, bituminous macadam paving 4.24 mi. hys. in Mechanic Falls and Fryeburg—gravel surfacing 22.15 mi. hys. in Mercer, Norridgewock, Washington, Union, China, Palermo, Wales, Monmouth, West Gardner and Gardner.

Maryland—Mar. 3, by State Roads Comn., Baltimore, improving roads in Charles, Allegheny, Garrett and Frederick Counties. L. H. Steuart, secy.; adv. E. N.-R. Feb. 26.

Maryland—Mar. 10, by State Roads Comn., Baltimore, G. C. Uhl, chn., 1,091,175 gal. oil on 338.81 mi. hys. in Cecil, Dorchester, Kent, Queen Anne's, Talbot, Wicomico, Worcester, Anne Arundel, Montgomery, Prince George's, Calvert, Charles, Howard, St. Mary's, Baltimore, Harford, Carroll, Frederick, Allegany, Garrett and Washington Counties; adv. E. N.-R. Feb. 26.

Michigan — Mar. 4, by J. T. Sharpensteen, div. engr., Escanaba, shaping, concrete paving 3.291 mi. FO21-9, Contr. 3, 20 ft., Delta Co., for State Hy. Comn., Lansing.

Michigan — Mar. 4, at office J. T. Sharpensteen, div. engr., Escanaba, shaping, concrete paving 8.069 mi. FO55-4, Contr. 2, 20 ft., Menominee Co., for State Hy. Comn., Lansing, G. C. Dillman, hy. comr.

N. J., Asbury Park—Mar. 3, by City Comn., concrete paving 2,030 sq.yd. incinerator approach in Shrewsbury Twp. E. K. Fowler, city engr.

New York—Mar. 13, by A. W. Brandt., comr. hys., Albany, improving hys. in Chautauqua, Montgomery, Onondaga, Oswego, Seneca, Warren and Westchester Counties; reconstructing hys. in Allegany, Chautauqua, Niagara and Otsego Counties; adv. E.N.-R. Feb. 26.

Oklahoma—Mar. 3 (extended date), by State Hy. Dpt., Oklahoma City, concrete slab surfacing 46,930 sq.yd. U. S. Hy. 66, west of Erick, $68,-000—41,600 sq.yd. U. S. Hy. 66, east of Texas State Line, $60,000—29,300 sq.yd. U. S. Hy. 66, east of Elk City, $42,000, all Beckham Co.—29,000 sq.yd. U. S. Hy. 75, south fo Colbert, Bryan Co., $40,000—35,200 sq.yd. West El Reno Rd., U. S. Hy. 66, $51,000—442,250 sq.yd. South E leRno Rd., U. S. Hy. 81, $85,000—44,250 sq.yd. West Ft. Reno Rd., $62,000 — 56,380 sq.yd. Union City Rd., U. S. Hy. 81, $81,000, all Canadian Co.—46,930 sq.yd. ashita County Line Rd., U. S. Hy. 66, $68,000—60,000 sq.yd. Clinton Rd., U. S. Hy. 66, $87,000, both Custer Co.—75,350 sq.yd. Chickasha-Tablor Rd., U. S. Hy. 277, Grady Co., $110,000—61,100 sq.yd. Horns Corners Rd., U. S. Hy. 75, Hughes Co., $85,000—46,930 sq.yd. Ryan Rd., U. S. Hy. 81, $68,00—51,200 sq.yd. Red River Rd., U. S. Hy. 81, $72,000, both Jefferson Co.—72,700 sq.yd. Oklahoma County Line Rd., U. S. Hy. 266, Lincoln o., $107,000—47,000 sq.yd. Mackintosh County Line Rd., U. S. Hy. 73, Muskogee Co., $68,000—46,930 sq.yd. Marrison Rd., U. S. Hy. 64, $68,000—51,800 sq.yd. Lela Rd., U. S. Hy. 64, $75,000, both Noble Co. — 28,340 sq.yd. Harrah Rd., U. S. Hy. 266, Oklahoma Co., $41,-000—82,400 sq.yd. Stillwater Rd., U. S. Hy. 40, Payne Co., $119,000—64,600 sq.yd. Chelsea Rd., U. S. Hy. 66, $96,000—46,930 sq.yd. South Chelsea Rd., U. S. Hy. 66, $68,000—46,930 sq. yd. East Bushyhead Rd., U. S. Hy. 66, $68,000 —46,930 sq.yd. East Foyal Rd., U. S. Hy. 66, $68,000—46,930 sq.yd. Sequyoah Rd., U. S. Hy. 66, $68,000—38,160 sq.yd. Clairmore Rd., U. S. Hy. 66, $58,000, all Rogers Co.—17,000 sq.yd. West Canute Rd., U. S. Hy. 66, $25,000—46,930 sq.yd. East Canute Rd., U. S. Hy. 66, $68,000—46,930 sq.yd. East Foss Rd., U. S. Hy. 66, $68,-000—46,930 sq.yd. West Foss Rd., U. S. Hy. 66, $68,000, all Washita Co.—4 mi. U. S. Hy. 31, $70,000—4.2 mi. U. S. Hy. 81, $80,000, both Grady Co.—5 mi. U. S. Hy. 81, $85,000—4 mi. U. S. Hy. 81, $68,000, both Kingfisher Co. A. R. Losh, hy. engr. Noted Feb. 19.

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Okla., Wewoka—Bd. Comrs. Seminole Co., bids after July 1, paving 10 mi. Seminole-Bowlegs Rd., 4 mi. Wewoka-Cromwell Rd. W. R. Grace, Court House, engr.

CONTRACTS AWARDED

Alabama—State Hy. Dpt., Montgomery, to J. B. McCrary Co., Citizens & Southern Bank Bldg., Atlanta, Ga., concrete paving 14.183 mi., Sumpter Co., $197,740; 11 mi. Escambia Co., $109,740 (state furnishes cement); 3.047 mi. Cullman Co., $47,566; 9.8 mi. Escambia Co., $111,806; 15.675 mi. Montgomery-Tuskegee Rd., $281,291 (state furnishes cement)—to Mitchell Bros., 3828 1st Ave. S., Birmingham, 16.663 mi. Talladega and Calhoun Counties, $109,149—to Hancock Bros., Mobile, 14.57 mi. Dallas Co., $195,019—to Brantley & Crowley, Banks, 10 mi. Pike Co., $57,625—to Penton-Mathis Co., Florala, bridges on same road, $37,984. Grand total $1,247,920. Noted Jan. 8.

Calif., Santa Clara—A. J. Cronin, city clk., to Union Paving Co., Standard Oil Bldg., San Francisco, grading, asphaltic paving Harrison St., et al $80,087, Santa Clara and Market Sts., et al $68,407, Lexington St. $29,956, Campbell Ave., Bellomy St., et al $10,997. Grand total $189,447.

Delaware — State Hy. Dpt., Dover, grading, broken stone base course, concrete paving 4.119 mi. Little Creek-Bay Rd., Contr. 168, to George & Lynch, Dover, $69,117—7.909 mi. Fleming's Corner-Whiteleysburg, Contr. 175, to W. W. Truitt, Lincoln City, $142,787 — 5.458 mi. Double Bridges-Redden, Contr. 179, to Highway Engr. & Constr. Co., Selbyville, $103,423 — clearing, grading, concrete paving 2.623 mi. Fieldsboro-Odessa, Dual Hy., Contr. 182, and clearing, grading, small structures, and fill, 1.797 mi. Odessa-Drawyers, Contr. 182-A, to R. E. Dutcher, Mt. Tremper, N. Y., $43,995 and $43,933 respectively. Grand total $403,255. Noted Jan. 8.

Louisiana—State Hy Comn., Baton Rouge, to James Stanton Constr. Co., Leavenworth, Kan., concrete surfacing 15.6 mi. hy. in Vernon Parish $359,154; 10 mi. Iberia Parish $227,-758; 9.4 mi. St. Landry Parish $253,407—to Koss Constr. Co., Old Colony Bldg., Des Moines, Ia., 11.8 mi. St. Bernard Parish $408,729—15.3 mi. Livingston and Tangipahoa Parishes $475,-361—to J. B. McCrary Co., Citizens & Southern Bldg., Atlanta, Ga., 15.6 mi. De Soto Parish $340,931—to Thompson Paving Co., Toledo, O., 10 mi. St. Tammany Parish $240,269—to T. L. James & Co., Ruston, 13.2 mi. Jackson and Lincoln Parishes $284,972—to Monroe Constr. Co., Monroe, 13.7 mi. Franklin and Richland Parishes $288,769 — to B. Flynn, Alexandria, 18.5 mi. Grant and Rapides Parishes $399,-512; Concordia Parish $429,807 — to Hardaway Constr. Co., Columbus, Ga., 9 mi. Jefferson and Plaquemines Parishes $260,638—to Merrill Eng. Co., Lamar Life Insurance Bldg., Jackson, Miss., asphaltic surface treatment 23 mi. and amiesite surfacing 8 mi. Jackson and Ouachita Parishes $189,951 — to R. B. Taylor Co., Louisville, Ky., asphaltic concrete surfacing 18 mi. Jackson Parish $111,668—to West Constr. Co., Volunteer Life Insurance Bldg., Chattanooga, Tenn., amiesite surfacing 7 mi. St. Landry Parish $96,377. Grand total $4,367,303. From Wilson & Walter, Mobile, Ala., grading, drainage structures 2.8 mi. Bush-Sun Hy., St. Tammany Parish, $24,670. All bids rejected asphalt surfacing 24 mi. Simpson-Zimmerman Hy., Vernon and Rapides Parishes. Noted Jan. 22.

Louisiana—State Hy. Comn., Baton Rouge, to Sandfer & Townsend, Bunkie, grading, drainage structures 3.8 mi. hy. in Avoyelles Parish, $18,-763—to Sullivan, Long & Hagarty, Bessemer, Ala., concrete surfacing 12 mi. hy. in Claiborne and Webster Parishes, $284,666—to S. R. Batson, 1430 North 30th St., Birmingham, Ala., 19 mi Washington Parish, $480,100 — to Reynolds & Sutton, Tyler, Tex., 13.1 mi. West Baton Rouge and Iberville Parishes, $391,773—to Roberts Paving Co., Salisbury, Md., 14 mi. Winn Parish, $384,127—to Copeland-Way, Inc., Atlanta, Ga., asphaltic surface treatment 6 mi. Caldwell Parish, $45,601 — to Nelson Bros., Columbian Mutual Tower Bldg., Memphis, Tenn., 16.3 mi. St. Helena Parish, $88,642; 25.7 mi. La Salle and Catahoula Parishes, $264,829; 8 mi. Vidalia and Concordia Parishes, $46,583; amiesite surfacing 10 mi. Tensas and Concordia Parishes, $133,326. Grand total $2,138,410. All bids rejected grading, drainage structures 26.3 mi. Golden Meadow-Grand Isle Hy., Lafourche and Jefferson Parishes. Noted Jan. 22.

Mississippi—State Hy. Comn., Jackson, clearing, grubbing, sodding, concrete culverts, grading 0.661 mi. roads in Jones and Covington Counties, to J. C. Anderson & Son, Raleigh, $33,497—3.578 mi. Jones Co., to E. E. Lovell, Prentiss, $64,631—3.782 mi. Lauderdale Co., to J. A. and H. E. Pigford, Russell, $26,200—7.54 mi. Newton Co., to Toulmin-McKee & Gannis, Mobile, Ala., $62,299—2.11 mi. Atalla and Holmes Counties, to C. G. Kershaw Constr. Co., Woodward Bldg., Birmingham, Ala., $119,-476—4 bridges in Newton Co., to J. P. Rowan, Holly Springs, $32,283. Grand total $338,386. Noted Feb. 5.

N. Y., New York—S. Levy, pres. Manhattan Boro, Municipal Bldg., installing 12 ft. radius at 165th St. and Bway. and other corners, to A. M. Goldsmith, 2511 Grand Central Terminal, $24,828; removing rock at Riverside Dr., to J. V. Timoney Constr. Co., 256 Bway., $7,575. Noted Jan. 29.

Tex., Beaumont — R. C. Black, city engr., Duraco on 5 in. rein.-con. paving 32,000 yd., to Broussard-Warfield Co., Beaumont, $108,058.

Virginia—State Hy. Comn., Richmond, clearing, grubbing, grading, drainage structures, one course macadam surfacing 4.885 mi. hy. in Frederick Co., and 3.232 mi. Roanoke and Botetourt Counties, to S .E. Finley, 292 North Ave. N., Atlanta, Ga., $98,358 and $72,704 respectively; clearing, grubbing, grading, drainage structures 4.023 mi. Rockbridge Co., to Norton Constr. Co., Norton, $76,512. Grand total $247,574. Noted Jan. 29.

Wisconsin — State and Polk, Rusk, Sawyer, Bayfield, Burnett and Douglas Counties, Telegram Bldg., Superior, graveling 9.5 mi. Glen-Flora-Hawkins Rd., U. S. Hy. 8, Rusk Co., to Schwerm Bros., Inc., 1775 20th St., Milwaukee, $86,181—3.87 mi. Hayward-Glidden Rd., S.T.H. 77, S.P. 8396, Sawyer Co., and 1.42 mi. Gordon Solon Springs Rd., S.P. 8310, Douglas Co., to Nelson, Mullen & Nelson, 355 Gateway Bank Bldg., Minneapolis, Minn., $30,869 and $16,242 respectively—grading 0.5 mi. Ingram Relocation, S.T.H. 73, S.P. 8439, Rusk Co., to Walters Bros., Holcombe, $3,656—grading 3.06 mi. Ashland-Washburn Rd., S.T.H. 13, S.P. 8389, Bayfield Co., and 8.31 mi. Siren-Spooner Rd., S.P. 8398, S.T.H. 70, to H. S. Kaliher, Washburn, $44,547 and $40,511 respectively — 5.4 mi. Ojibwa-Winter Rd., S.T.H. 70, S.P. 8417, Burnett Co., to L. G. Arnold, Inc., Eau Claire, $42,586 —4.6 mi. St. Croix Falls-Grantsburg Rd., S.P. 8385, Burnett Co., to V. Nelson, Superior, $33,-440—St. Croix-Falls-Grantsburg Rd., S.T.H. 87, Project 8386, Sawyer Co., to Bernard-Curtiss Co., 504 Globe Bldg., Minneapolis, Minn., $93,841. Grand total $391,873. Received bids paving 3.06 mi. Ashland-Washburn Rd., S.T.H. 13, Bayfield Co., from Carl Bong, Boplar, $27,416; bridge on Hayward Cable Rd., S.T.H. 24, Bayfield Co., from A. N. Nelson, Duluth, Minn., $12,944. Noted Feb. 12.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Ind., Huntington — Bd. Comrs. Huntington Co., Smelser Ditch. $25,000. E. Collins, Huntington, engr.

Ind., Seymour—Bd. Comrs. Jackson Co., constructing Cammie Thomas Ditch. $43,000. E. Zebel, Seymour, engr.

Mass., Barnstable—Commonwealth of Massachusetts, Dpt. P. Wks., State House, Boston, and Town, dredging in Mill Creek and East Bay. $25,000 or more.

Mass., Falmouth—Commonwealth of Massachusetts, Dpt. P. Wks., Boston, dredging, repairing breakwater, Waquiot Bay. $25,000. A. W. Dean, Dpt. P. Wks., Boston, engr.

Mass., Holyoke—Holyoke Water Power Co., 1 Canal St., applied for license for dredge channel from bridge to power station and fill solid from dam, Connecticut River. $25,000 or more. Private plans.

Mass., Marion — Commonwealth of Massachusetts, Dpt. P. Wks., Boston, dredging in Marion Harbor from depth of 9 to 11 ft. mean low water. $40,000. A. W. Dean, Dpt. P. Wks., Boston, engr.

Mass., Marshfield—Commonwealth of Massachusetts, State House, Boston, Town, Plymouth Co. (Plymouth), and abutting property owners, seawall along exposed section of beach. $100,-000. Dpt. P. Wks., Boston, engr.

Mass., Scituate — Commonwealth of Massachusetts, State House, Boston, Plymouth Co. (Plymouth), Town, and abutting property owners sea wall along exposed section of beach. $50,000. Dpt. P. Wks., Boston, engrs.

Mass., Tisbury — Commonwealth of Massachusetts, Dpt. P. Wks., State House, Boston, dredging Lagoon Pond. $34,000. Towns of Tisbury and Oak Bluffs to share expense. A. W. Dean, Dpt. P. Wks., Boston, engr.

Wash., Seattle—King Co., dredging 1,200,000 cu.yd. in Duwamish Waterway. $200,000. T. D. Hunt, Seattle, co. engr. U. S. Govt. pays $100,000 towards cost.

Ont., Toronto—City shore protection at Exhibition Park, incl. steel sheet piling, filling, etc. $294,000. R. C. Harris, City Hall, engr.

BIDS ASKED

La., New Orleans—Mar. 10, by Bd. Comrs. Lake Borgne Levee Dist., at office Bd. of State Engineers, engrs., 207 New Orleans Court Bldg., back protection levee known as Jackson Levee, incl. 300,000 cu.yd. earth excav., in St. Bernard Parish. F. Ahrens, secy.

Okla., Oklahoma City—Olkahoma Co., c/o J. M. Berry, clk., bids about Mar. 15, drainage ditch from Witcher to Arcadia, incl. 350,000 cu.yd. excav. $70,000. J. F. Frazier, Oklahoma City, co. engr. R. James, 419 Cotton Exch. Bldg., consult. engr.

CONTRACTS AWARDED

Nebraska—Bd. Trustees Lancaster Co. Sanitary Dist. 1, W. C. Frampton, secy., 427 Bankers Life Bldg., Lincoln, deepening, widening Salt Creek in west half Sect. 32-11-7, incl. 369,948 cu.yd. channel, 1,147 cu.yd. side ditch excavating, to Martin-Day Co., 312 Little Co., Lincoln, $25,641. Noted Jan. 29.

Okla., Pauls Valley—Wild Horse D. D. 2, 215 stations open ditch work, incl. 122,000 cu.yd. excav., to Kennedy & Overman, Pauls Valley, at $0.1425 per cu.yd. Noted Nov. 27.

Tennessee—State Dpt. Hys. & P. Wks., Nashville, 230 ft. concrete spillway at Reelfoot Lake, Obion Co., to Frazier-Davis Constr. Co., Arcade Bldg., St. Louis, Mo., $51,477. Noted Jan. 8.

Bond Elections

Coming Bond Elections

Waterworks Impvts.—Globe Ariz., $50,000.
Waterworks Impvts.—Fairfield, Calif., $39,200.
Waterworks—Milstadt, Ill., $50,000.
Waterworks Impvts.—Kansas City, Mo., May 12, $3,500,000.
Supplementary Water Supply—Lincoln, Neb., Apr. 7, $2,400,000.
Reservoir—Hornell, N. Y., Mar. 11, $70,000.
Sewage Disposal Plant, Jail, etc. — Duluth, Minn., Apr. 7, $1,730,000.
Storm Sewers—Joplin, Mo., $300,000.
Sewers—Kansas City, Mo., Mar. 12, $1,500,000.
Flood Control — Kansas City, Mo., May 12, $700,000.
Airport—Kansas City, Mo., May 12, $500,000.
Parks, Playgrounds, Stadium and Theatre — Kansas City, Mo., May 12, $3,500,000.
Parks and Playgrounds — Los Angeles, Calif., $2,000,000.
Auditorium—Fresno, Calif., $2,000,000.
Court House (remodel)—Jackson County, Mo., May 12, $200,000.
Court House, etc.—Jackson County, Mo., May 12, $4,200,000.
City Hall, etc. — Kansas City, Mo., May 12, $9,000,000.
Hospital—Kansas City, Mo., May 12, $2,000,000.
High School Addition — Las Banos, Calif., $175,000.
School Addition — Sioux City, Ia., Mar. 9, $400,000.
Schools—St. Paul, Minn., Apr. 7, $975,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Conn., Waterbury — POST OFFICE — Treas. Dpt. at office Sup. Archt., U. S. Post Office. $570,000.

Fla., Miami—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by P. Paist & H. D. Stewart, 834 Ingraham Bldg., and L. M. Dixon, assoc. archt., 834 Ingraham Bldg., 3 story, basement, 215 x 254 ft. post office, facing 1st Ave. between Northeast 3rd and 4th Sts. H. Baxter, 834 Ingraham Bldg., and P. O. Box 65, Coconut Grove, structural engr. M. H. Connell, McAllister Hotel Bldg., mechanical engr.

Ky., Louisville—HOSPITAL—Treas. Dpt. at office Sup. Archt., brick, stone marine hospital, 27th and Portland Sts. $460,000.

Me., Machias—BOAT HOUSE—U. S. Coast Guard Service, boat house and landing at Cross Landing.

Mich., Sault Ste. Marie — WAREHOUSE — U. S. Eng., Detroit, new warehouse.

Minnesota — DREDGING — U. S. Govt., W. Willing, dist. engr., 615 Commerce Bldg., St. Paul, widening channel in Mississippi River at St. Paul River Terminal, incl. 300,000 cu.yd. excav.; dredging government dam in Mississippi River, incl. 155,000 cu.yd. clean river sand, at Hastings.

Minn., St. Paul—FEDERAL—Treas. Dpt. at office Sup. Archt., plans by L. Bassindale, 485 Endicott Bldg., federal building. Holabird & Root, 333 North Michigan Ave., Chicago, Ill., consult. archts.

Mass., Bedford — HOSPITAL — Vet. Bu., Arlington Bldg., improvement, addition at U. S. Veterans Hospital. $280,000 appropriated.

Mass., Chelsea—HOSPITAL—Yards & Docks, Navy Dpt., 3 story, basement, brick addition of Ward Wing at Naval Hospital.

Mass., Lynn—DREDGING—U. S. Eng., Boston, soon takes bids in Lynn harbor. $90,000.

Mass., Taunton—DREDGING—U. S. Eng., Providence, R. I., in Taunton River. $880,000.

N. J., West New York—POST OFFICE, etc. —Treas. Dpt., at office Sup. Archt., 2 story, basement post office and federal building. $375,000.

Pa., Altoona—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by Royer & Anglemeyer, Commerce Bldg., F. J. Shollar, assoc. archt., Commerce Bldg., and Eric Fisher Wood & H. Hornbostel, Hardy & Hayes, consult. archts., Bldg., Pittsburgh, 1 story, basement, 125 x 200 ft., brick, stone, 12th St. and 11th Ave. $775,000. Noted Feb. 12.

Pa., Phila.—JETTY—U. S. Eng., removing 1,200 ft. outer end north jetty and adjacent ice pier at mouth Christiana River.

Tex., Brownsville—FEDERAL—Treas. Dpt., at office Sup. Archt., 4 story, basement building to house post office, federal court, immigration and public health station. $450,000. Noted Nov. 20.

Tex., Harlingen—POST OFFICE—Treas. Dpt., at office Sup. Archt., U. S. Post Office. $170,000.

Tex., McAllen—POST OFFICE—Treas. Dpt., at office Sup. Archt., fireproof U. S. Post Office. $140,000-$150,000.

W. Va., Huntington—LOCK—U. S. Eng., one of twin locks on London site, Kawauha River.

Wis., Alma — DAM, etc. — U. S. Govt., W. Willing, dist. engr., 615 Commerce Bllg., St. Paul, Minn., 12 ft. rein.-con. dam with lock in Mississippi River. $3,000,000.

Wyo., Lander—DORMITORY, etc.—Bureau Indian Affairs, Dpt. Interior, sketches girls dormitory, 4 employees cottages, employees building, on Wind River Indian Reservation, Fort Washakie. $800,000 appropriated.

BIDS ASKED

Arizona—ROAD—Mar. 3, by C. H. Sweetser, dist. engr., Pub. Rds., 461 Market St., San Francisco, Calif., grading 8.432 mi. Sect. B, Route 28, Houserock Canyon Natl. Forest Hy., Coconino Co., 121,800 cu.yd. unclass. excav. Noted Oct. 23.

Calif., Riverside—QUARTERS—Mar. 10, at office Con. Q. M., 2 sets field officers and 8 sets company officers quarters at March Field; adv. E. N.-R. Feb. 26.

D. C., Wash.—LUMBER—Mar. 6, by A. L. Flint, genl. purch. officer Panama Canal, untreated lumber (southern yellow pine, Douglas fir, west coast hemlock, California redwood and western red cedar) and creosoted and untreated southern yellow pine and Douglas fir timbers. Schedule 2632.

Ill., Rock Island—LOCKS—Mar. 23, by U. S. Eng., Federal Bldg., 2 parallel locks, at Lock and Dam 15, Mississippi River; adv. E. N.-R. Feb. 26.

Kan., Pittsburg—POST OFFICE—Mar. 3, by Treas. Dpt., at office Sup. Archt., extending, remodeling U. S. Post Office.

La., New Orleans—EARTHWORK—Mar. 16, by U. S. Eng., foot Prytania St., 3,020,000 cu. yd. earthwork in Bordelonville-West Levee, 2nd New Orleans Levee Dist.

La., New Orleans—LEVEE—Mar. 3, by U. S. Eng., foot Prytania St., 1,115,000 cu.yd. earthwork in 2nd New Orleans Levee Dist.

La., New Orleans—LEVEE—Mar. 3, by U. S. Eng., Prytania St. and Riverfront, 635,000 cu.yd. earthwork in South Bank Red River Levee, 2nd New Orleans Levee Dist.

Minn., Duluth—DREDGING, etc.—Mar. 9, by U. S. Eng., 4,700 ft. channel in Howards Bay, and extension of Superior Harbor basin in Duluth Superior Harbor. Noted Dec. 8, under "Minnesota and Wisconsin."

N. J., Lakehurst—BARRACKS, etc.—Yards & Docks, Navy Dpt., taking bids 3 story, basement, brick, steel barracks, officers quarters, at Naval Air Station. $250,000.

N. J., Manasquan—DREDGING—Mar. 5, by U. S. Eng., 39 Whitehall St., New York, 275,000 cu.yd. in Manasquan River and Inlet; adv. E. N.-R. Feb. 26. Noted Feb. 5.

N. Y., Brooklyn—DRY DOCK—See "Contracts Awarded."

N. Y., Brooklyn — WATER FRONT IMPROVEMENTS—See "Contracts Awarded."

Pa., Kittanning—POST OFFICE—Mar. 13, by Treas. Dpt. at office Superv. Archt., 1 story, basement, brick, stone, Arch and McKean Sts. $150,000. Noted Dec. 25.

Tenn., Memphis—REVETMENT WORK—See "Contracts Awarded."

Tenn., Murfreesboro—REMODELING, etc.—Mar. 18, by Treas. Dpt. at office Sup. Archt., remodeling, enlarging U. S. Post Office; adv. E. N.-R. Feb. 26.

Va., Langley Field—PUMPING PLANTS—Mar. 23, at office Con. Q. M., Fort Monroe, 2 sewage pumping plants, and force main at Heavier-Than-Air, Langley Field; adv. E. N.-R. Feb. 26.

Va., Langley Field—QUARTERS—Mar. 20, at office Con. Q. M., Fort Monroe, 16 double company officers quarters; adv. E. N.-R. Feb. 26.

CONTRACTS AWARDED

Arkansas — DIKE — U. S. Eng., Memphis, Tenn., 1,500 ft. permeable pile dike in Mississippi River, in Chute of Island No. 35, to Patton-Tully Transportation Co., North 2nd St., Memphis, Tenn., $49,081.

Conn., New London—HEATING, etc.—Treas. Dpt. at office Sup. Archt., heating for U. S. Coast Guard Academy, to Frederick Raff Co., 164 State St., Hartford, Conn.; plumbing, to B. Greenwald, Inc., Omaha, Neb.; electrical work, to W. R. McLoughlin, 274 Main St., Worcester, Mass. Noted Jan. 8.

Florida—DREDGING—U. S. Eng., Jacksonville, channel approach to port of St. Petersburg, to Clark Dredging Co., 357 North River Dr., Miami, $45,000. Noted Jan. 8.

Idaho, Minidoka — GATES, etc.—U. S. Reclamation Ser., Denver, Colo., gates for Pumping Stations 1 and 2, Minidoka Project, to Omaha Steel Wks., 609 South 48th St., Omaha, Neb., $1,271; gate hoists, to Commercial Iron Wks., 380 East Stephens Sa., Portland, Ore., $1,272.

Ind., Indianapolis—HOSPITAL—Treas. Dpt. at office Sup. Archt., building and utilities at U. S. Veterans' Hospital, to Ralph Sollitt & Sons Constr. Co., South Bend, Ind., $484,030. Noted Dec. 11.

Mass., Fall River—HEATING, etc.—Treas. Dpt. at office Sup. Archt., heating and plumbing for U. S. Post Office, to J. H. Larkin, 208 Corey Rd., Brookline; electrical work, to Crawford Electric Co., 165 Rodman St., Fall River. Noted Jan. 1.

Miss., Gulfport — DISPOSAL PLANT — Vet. Bu., Arlington Bldg., rein.-con., tile sewage disposal plant, to L. Gertner, Jr., 8233 Harper Ave., $31,190. Noted Feb. 9.

Mo., St. Louis—DREDGE PONTOONS—U. S. Eng., 428 Custom House, 22 steel dredge pontoons, to St. Louis Structural Steel Co., 57th St. and Baltimore & Ohio R.R., East St. Louis, Ill., $40,986. Noted Jan. 15.

Montana — ROAD — U. S. Forest Serv., Missoula, grading, culverts, guard rail on 12 mi. Project 26 A, Butte Boulder Hy., to C. and F. Teaming & Trucking Corp., Butte, $129,495. Est. $190,000.

N. J., Manasquan—JETTIES—U. S. Eng., 39 Whitehall St., extending 2 jetties at Manasquan Inlet, to Jesse Howland & Sons, Inc., Seabright, at $4.18 per ton, ⅜ in. stone and $35 per lin.ft. for core. Noted Jan. 22.

N. Y., Brooklyn—DRY DOCK—Navy Dpt., c/o P. Wk., Dpt., U. S. Navy Yards, dry dock, Brooklyn Navy Yard, day labor. $750,000.

N. Y., Brooklyn—WATER FRONT IMPROVEMENTS—Navy Dpt., c/o P. Wks. Dpt., Brooklyn Navy Yard, water front improvements vicinity Brooklyn Navy Yard, day labor. $200,000.

Oregon—ROAD—Pub. Rds., Post Office Bldg., Portland, improving (using metal pipe) 5.844 mi. Williamette Hy., Lane Co., 18 ft., to E. L. Gates, Camela, $152,624.

Tenn., Memphis — ELEVATOR — Vet. Bu., Arlington Bldg., elevator in addition to Main Building 1, to Moffatt Mchy. Co., Box 384, Charlotte, N. C., $11,357.

Tenn., Memphis — REVETMENT WORK — U. S. Eng., revetment work in Happy Valley, Bend of Island 12, Mississippi River and in Memphis Harbor; hired labor and government plant.

Texas—DREDGING—U. S. Eng., Galveston, dredging channel from Aransas Pass to Corpus Christi, to Standard Dredging Co., 323 Guaranty Bldg., Galveston, $309,244. Noted Jan. 8.

Utah, Salt Lake City—FOUNDATION, etc.—Treas. Dpt. at office Sup. Archt., foundation, excavation, for federal building, to T. G. Roland, Salt Lake City, $51,800. Noted Feb. 11.

Wis., Appleton—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to Tapager Constr. Co., Albert Lea, Minn., $167,849. Noted Jan. 15.

RAILWAYS

PROPOSED WORK

Washington—Municipal Railway Dpt., received no bids Feb. 6, constructing 2.09 mi. municipal street railway extension on 8th Ave. N. W. from Leavy Way to West 85th St. in Seattle. $200,000. R. H. Thomson, Seattle, engr. Noted Feb. 5.

BIDS ASKED

Pennsylvania—See "Contracts Awarded."

CONTRACTS AWARDED

Pennsylvania—Pennsylvania R.R. Co., Broad St. Sta., Phila., T. J. Skillman, ch. engr., 16 mi. track reconstruction Conemaugh Div. from Kiskiminetos Junction to Venango, day labor and separate contracts.

Texas—Emery, Peck & Rockwood Development Co., Marble Falls, and Scarbrough Bldg., Austin, grading 1¼ mi. right-of-way for private line, in Marble Falls, to F. Holt, Austin and Marble Falls, $25,000; 3¾ mi. balance of work will be done by own forces. Noted Feb. 19.

SUBWAYS AND TUNNELS

BIDS ASKED

Pa., Phila.—Mar. 16, by Dpt. City Transit, E. E. Myers, dir., City Hall Annex, 1,078 ft. 4 track subway under Market St. from 30th to 32nd Sts., also 1 passenger station. Contr. 262.

GRADE CROSSINGS

PROPOSED WORK

Calif., Bradley—State Hy. Comn., Sacramento, C. H. Purcell, ch. engr., and Atchison, Topeka & Santa Fe R.R. Co., 80 East Jackson Blvd., Chicago, Ill., G. W. Harris, ch. engr., surveys overhead crossing, Merced Co. $184,000.

Mass., Bridgewater — Commonwealth of Massachusetts, State House, Boston, Town, and New York, New Haven & Hartford R.R., E. E. Oviatt, ch. engr., New Haven, Conn., grade crossing—overpass—Town Way. $150,000. A. W. Dean, Dpt. P. Wks., Boston, engr.

Mass., Lincoln — Commonwealth of Massachusetts, Boston, Town and Boston & Maine R.R., W. J. Backes, ch. engr., Boston, grade crossing — overpass — Town Way. $150,000. A. W. Dean, Dpt. P. Wks., Boston, engr.

Mass., Shirley — Town, Commonwealth of Massachusetts, State House, Boston, and Boston & Maine R.R., W. J. Backes, ch. engr., Boston, grade crossing—overpass—Town Way. $250,000. A. W. Dean, Dpt. P. Wks., Boston, engr.

Mass., Taunton — Commonwealth of Massachusetts, State House, Boston, City, and New York, New Haven & Hartford R.R., E. E. Oviatt, ch. engr., New Haven, Conn., grade crossing—overpass—state hy. $60,000. A. W. Dean, Dpt. P. Wks., Boston, engr.

Mass., Tewksbury—Commonwealth of Massachusetts, State House, Boston, Town, and Boston & Maine R.R., W. J. Backes, ch. engr., Boston, grade crossing—overpass—Town Way, Main St. $200,000. A. W. Dean, Dpt. P. Wks., Boston, engr.

Mass., Weymouth — Commonwealth of Massachusetts, State House, Boston, Town, and New York, New Haven & Hartford R.R., E. E. Oviatt, ch. engr., New Haven, Conn., grade crossing—overpass—state hy., Main St. $80,000. A. W. Dean, Dpt. P. Wks., Boston, engr.

Mo., St. Louis — City, preliminary plans 2 rein.-con., tile lined underpasses, each 110 ft. long, 10 ft. wide, 10 ft. high, one on south line Market St. under 12th Blvd., other on east line 12th Blvd. under Market. $48,000.

N. Y., Endicott — Erie R.R. Co., G. S. Fanning, ch. engr., 50 Church St., New York, eliminating Nanticoke Ave. and Liberty St. crossings.

Ont., Bowmanville—Dpt. P. Hys., Parliament Bldgs., Toronto, overhead hy. bridge over

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Grade Crossings (Continued)

Canadian Pacific Ry., on Hy. 2, near here, incl. concrete abutments, piers, probably steel spans. $30,000. A. A. Smith, Parliament Bldgs., Toronto, ch. engr.

BIDS ASKED

California—Mar. 11, by State Hy. Comn., Sacramento, undergrade crossing consisting 2 concrete abutments with wing walls, under Southern Pacific R.R. at New England Mills, also grading, bituminous treated crushed gravel or stone surfacing 1,000 lin. ft. roadway, Placer Co. C. H. Purcell, hy. engr.

California—See "Streets and Roads."

Calif., Essex — Mar. 11, by C. H. Purcell, engr. State Hy. Comn., Sacramento, overhead crossing to have one 48 ft. and four 34 ft. rein.-con. girder spans on concrete bents over Atchison, Topeka & Santa Fe R.R., 2 mi. east of here, San Bernardino Co.

Ind., Huntington—Apr. 1, by City and Erie R.R. Co., 50 Church St., New York, G. S. Fanning, ch. engr., 450 ft. rein.-con. subway, 4 lane hy. $125,000. P. V. Smith, Huntington, engr.

DAMS

PROPOSED WORK

Colo., Grand Junction—See "Power Plants."

PIERS AND WHARVES

PROPOSED WORK

N. Y., New York—PIER—Dpt. Docks, M. Cosgrove, comr., Pier A, Battery Pl., bids late in March, preliminary dredging on section from 47th and 50th Sts.; bids about July, cofferdam and pier construction. To exceed $10,000,000.

N. Y., New York—PIER and TERMINAL—Dpt. Docks, M. Cosgrove, comr. Pier A, Battery Pl., bids early in March, general contract pier, Pier 45, West 10th St. and Hudson River; bids later sheds, dredging equipment. $1,200,000. Cosulich Line, 17 Battery Pl. and Navigazione Generale Italiana, 1 State St., lessee.

BIDS ASKED

Mo., Kansas City — WHARF — Mar. 5, by M. S. Murry, dir. P. Wks., 1 and 2 story, 85 x 300 ft., brick, rein.-con. municipal wharf. $500,000. Private plans. Noted Dec. 18.

AIRPORTS

PROPOSED WORK

Ariz., Nogales—International Airport, c/o T. Griffin, Nogales, 114 ft. hangar, 30 ft. high, 40 ft. wide, other airport improvements. $54,000. C. O. Gilliam & Co., Phoenix, Ariz., engrs.

Okla., El Reno—City, J. H. Bender, city mgr., preliminary plans municipal airport. $75,000. J. H. Bender, El Reno, engr.

Tex., Eagle Pass—Maverick Co., airport on 320 acre tract of land, incl. runways, steel hangars, shop, main building for housing equipment, lighting system. $100,000. W. L. Rockwell, Eagle Pass, co. engr.

CONTRACTS AWARDED

Calif., San Diego—Pacific Air Transport Co., Lindbergh Bldg., 1 story, 90 x 130 ft., brick, steel depot hangar, to Austin Co., 16112 Euclid Ave., Cleveland, O. Est. $50,000.

POWER AND LIGHTING

PROPOSED WORK

Mo., Centralia—City, preliminary plans natural gas distribution system. W. B. Rollins & Co., 339 Railway Exch. Bldg., Kansas City, engrs.

Mo., Higginsville — City, R. A. Huscher, mayor, preliminary plans natural gas distribution system. J. W. Shikles Eng. Co., 708 New York Life Bldg., Kansas City, engr.

Mo., Vandalia—City, M. Barrow, clk., preliminary plans 8.5 mi. pipe for natural gas distribution system. W. B. Rollins & Co., 339 Railway Exch. Bldg., Kansas City, engr.

New York—New York Central Electric Corp., 12 Bway., Hornell, extending electric plant for furnishing electricity in town of Ward, extending 4,600 volt transmission line 4 mi. from Alfred, line to be fed from substations at Hornell and Elmira.

PARKS AND SPORTS

PROPOSED WORK

La., Gretna — Swimming Pool Assn., c/o A. Samuel, 620 1st St., chn., soon takes bids 50 x 150 ft. rein.-con. swimming pool, drilled well, bathhouse. $25,000. T. L. Perrier, Maritime Bldg., New Orleans, engr.

Mass., Arlington—Town, Bd. Selectmen, concrete grandstand, field improvements at Warren Pierce Field. $25,000. Engineer not selected.

Mass., Boston—City, Park Dpt., 33 Beacon St., plans by J. G. McGann, 129 Newbury St., Antelope House, 1 story, brick, timber, Franklin Park, Dorchester, $60,720 appropriated.

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Mass., Needham — Town, Bd. Selectmen, swimming pool and skating rink. $50,000. Engineer not selected.

Minn., Duluth—See "Sewers."

N. J., Elizabeth — Recreation Comn., City Hall, will not build natatorium. $50,000. Project abandoned. Noted Aug. 8.

N. J., Ridgewood—Bd. Village Comrs., 29 Hudson St., municipal swimming pool, North Maple and Linwood Aves. $25,000. **Maturity probably soon.** R. A. Horton, village engr.

N. Y., Rockaway Beach—Dpt. Parks, W. R. Herrick, pres. Park Bd., Arsenal Bldg., Central Park, New York, 2 story, 132 x 616 ft. bathing pavilion, Jamaica Bay and Beach 169th St. $425,000. Stoughton & Plock, 250 East 43rd St., archts.

BIDS ASKED

N. Y., Sunnyside—Sunnyside Outdoor Recreation Center, 501 Madison Ave., New York, taking bids general and separate contracts lockers, locker and shower rooms, swimming pool, 51st St. and Roosevelt Ave. $50,000. W. Haugaard, 21 West 45th St., New York, archt. Noted Jan. 1.

N. J., West New York — See "Contracts Awarded."

CONTRACTS AWARDED

Mass., Gloucester—H. Smith, Middle St., concrete swimming pool, Western Ave., to Parker & Walsh, 22 Chapman St., Beverly.

Mo., Normandy—Bellerive Country Club, W. J. Knight, chn., Wainwright Bldg., 10 x 40 x 90 ft. rein.-con., tile lined swimming pool, to W. H. and Nelson Cunliff Co., 3327 Lindell Blvd., St. Louis.

N. J., West New York—Bd. Town Council, Municipal Bldg., filling, grading, rock excavating, installing new electric system, fence at playground in Jackson St. between 13th and 15th Sts., day labor, $25,000. F. Oleri, 650 Bergenline Ave., town engr. Noted Feb. 5.

HEATING AND VENTILATING

BIDS ASKED

N. Y., Orangeburg—Mar. 18, by Dpt. Mental Hygiene, State Office Bldg., Albany, heating, sanitary work, kitchen equipment, Building 38, Rockland State Hospital; adv. E. N.-R. Feb. 26.

UNCLASSIFIED

PROPOSED WORK

Calif., San Francisco — PIER SHED — California State Bd. Harbor Comrs., Ferry Bldg., 160 x 800 ft. steel, concrete shed and bulkhead building at Pier 15. F. G. White, Ferry Bldg., engr.

Calif., San Francisco — REFRIGERATION FACILITIES — California State Bd. Harbor Comrs., double capacity of shipside refrigerating facilities. $100,000. F. G. White, Ferry Bldg., engr.

Mass., Quincy—OIL STATION—Quincy Oil Co., 57 Federal St., preliminary sketches bulk oil station. To exceed $25,000. G. E. St. Laurent, 57 Federal St., engr.

Wash., Seattle — CONCRETE HANDLING PLANT—Pioneer Sand & Gravel Co., 901 Harrison St., tru-mix concrete handling plant, incl. wharf, bunkers, conveyor gallery, crane, and concrete mixing machinery.

BIDS ASKED

California — PIPE LINE — See "Contracts Awarded."

Calif., Los Angeles — TERMINAL IMPROVEMENTS — See "Contracts Awarded."

N. Y., Central Islip—FIRE SPRINKLERS—Mar. 25, by Dpt. Mental Hygiene, State Office Bldg., Albany, automatic fire sprinklers South Colony, Central Islip State Hospital; adv. E. N.-R. Feb. 26.

N. Y., Central Islip—LIGHTING FIXTURES—Mar. 11, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, ornamental lighting fixtures, New Buildings, Central Islip State Hospital; adv. E. N.-R. Feb. 26.

N. Y., Ithaca—FOUNDATION—Mar. 19, by Commissioner Dpt. Educ., State Educ. Bldg., Albany, foundation for agricultural, economics, marketing and farm management building, Cornell University.

N. Y., Oneonta—FOUNDATION—Mar. 19, by Commissioner Dpt. Educ., Education Bldg., Albany, foundation for new building at State Normal School.

Wyoming and Nebraska—PIPE LINE—North Central Gas Co., c/o New York Oil Co., 39 Bway., New York, bids about Mar. 1, for pipe and pipe laying for pipe line from Big Muddy Field, Wyo., via Casper to Nebraska. $1,000,000.

CONTRACTS AWARDED

California—PIPE LINE—Associated Oil Co., P. E. Bldg., Los Angeles, welding joints and reconditioning 6 in. oil pipe line from Coalinga to Monterey, for gasoline transportation, separate contracts and day labor. Est. exceeds $40,000.

Calif., Los Angeles—TERMINAL IMPROVEMENTS—City Harbor Comn., terminal improvements, incl. driving timber piling, placing riprap, grading, driving shed column footing piles at Berths 144-146, in West Basin, own forces. $104,000 appropriated.

N. J., Peapack—STABLES—R. V. N. Gambill c/o J. C. MacKenzie, Jr., 3 East 57th St., New York, 1 and 2 story, basement, 150 x 150 ft. brick, steel stable group, plain and shoring founds., to Mathews Constr. Co., Princeton. Est. $150,000. Noted Feb. 12.

N. Y., New York—PIPE TUNNELS, etc.—Bd. Higher Educ., at office Secretary Hunter College, Park Ave. and 68th St., general contract pipe tunnels and passages, for Hunter College, to O'Driscoll & Grove, 415 Lexington Ave., $99,948; heating, to Cascade Auto Sprinkler Co., 420 Lexington Ave., $19,355; electrical work, to Martin Epstein & Co., 118-35 Metropolitan Ave., Kew Gardens, $18,500. Grand total $137,803. Noted Jan. 29.

N. Y., New York—REFRIGERATION, etc.—Ruspyn Corp., P. P. Pogne, pres., 50 East 42nd St., refrigeration, washrooms, and altering theatre, to Wildman & Newman, 33 West 42nd St. Est. $40,000. Noted Jan. 8.

MATERIALS

PROPOSED WORK

CAST IRON PIPE—**Beaumont, Tex.**—City, c/o R. Edmonds, soon takes bids furnishing 4,000 ft. 8 in. B and S c.i. pipe, Class B or equivalent.

BIDS ASKED

ROAD OIL—**Winona, Minn.**—Mar. 3, by A. Baeuerlan, aud. Winona Co., 175,000 gal. road oil.

ASPHALT CEMENT, etc.—**Maplewood** (br. South Orange), **N. J.**—Feb. 28, by Twp. Com., Township Hall, 20,000 gal. asphalt cement emulsion, Grade A. E; 20,000 gal. asphalt cement, Grade O. A. 4; 10,000 gal. native lake asphalt, Grade N. A. 4, 40,000 gal. barber brand liquid asphalt, Grade A; 10,000 gal. tar, Grade X; 10,000 gal. asphaltic oil, Grade B. C. O.; 1,500 gal. barber brand winter cold patch; 500 tons bituminous concrete Type A; 500 tons bituminous concrete, Type T. H. W. Heilman, 9 Highland Ave., engr.

GASOLINE and OIL—**Virginia**—Mar. 10, by State Hy. Dpt., Richmond, 1,494,000 gal. gasoline, 82,550 gal. oil.; adv. E. N.-R. Feb. 26.

CULVERTS—**West Bend, Wis.**—Mar. 3, by Washington Co. Hy. Comn., 12- to 36-in. corrugated sheet metal culverts (1931 supply) in car lots. W. Goebel, comr.

CONTRACTS AWARDED

PIPE—**Austin, Minn.**—City, 4,000 lin.ft. c.i. water pipe to J. B. Clow & Son, 640 McKnight Bldg., Minneapolis, $5,208.

GRAVEL, STEEL, etc.—**Mississippi**—State Hy. Comn., Jackson, 4,900 tons washed gravel in Hancock Co., to Western Sand & Gravel Co., Logtown, at $1.25 per ton; 37,850 lb. structural steel I-beams 61 ft. over all, to Austin Bridge Co., 1813 Clarence St., Dallas, Tex., at $2.97 per lb. Noted Feb. 5.

BITUMINOUS CINDERS—**Linden, N. J.**—Mayor and City Council, 10,000 cu.yd. bituminous cinders for city streets, to Commercial Contg. Co., 719 Livingston St., Elizabeth, $10,500.

CORRUGATED PIPE—**Newton, N. J.**—Sussex Co., Court House, corrugated pipe, to Eastern Culvert Co., 16th St. and Washington Ave., Phila., Pa., $5,457; wire rope, to Loder & Sharp, 3131 Powelton St., Phila., Pa., $2,950; guard railings, to Daily Lockwood Co., Phila., Pa., $830. Grand total $9,237. Noted Feb. 6 Daily.

ASPHALT SAND, etc.—**New York, N. Y.**—S. Levy, pres. Manhattan Boro, Municipal Bldg., Feb. 11, 25,000 cu.yd. asphalt sand, to Z. Mahoney, 430 Carroll St., Brooklyn, $23,500; iron castings, to Campbell Fdry. Co., foot Worthington St., Harrison, N. J., $18,776. Noted Feb. 5.

CINDERS—**New York, N. Y.**—H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., 60,000 cu.yd. cinders, to Empire Cinders Delivery Corp., 341 Madison Ave., $46,000. Noted Feb. 5.

PAVING SAND—**New York, N. Y.**—S. Levy, pres. Manhattan Boro, Municipal Bldg., 3,000 cu.yd. sand and 4,000 cu.yd. sand grit, to Colonial Sand & Stone Co., 551 5th Ave., $6,300 and $8,600 respectively; 3,500 cu.yd. coarse aggregate, to W. J. McCormick Sand Co., 285 Madison Ave., $11,025. Grand total $25,925. Noted Jan. 29.

EQUIPMENT

BIDS ASKED

DIESEL ENGINE—**Gridley, Calif.**—Mar. 9, by J. L. Lewis, city clk., diesel engine to replace present inadequate steam plant standby service. Former bids rejected. Noted Feb. 9.

TRUCKS, etc.—**Fargo, Minn.**—Mar. 5, by F. F. Doherty, aud. Cass Co., trucks and other road machinery.

TRUCK—**Hastings, Minn.**—Mar. 12, by J. M. Langenfeld, co. aud., and 1 ½ ton truck and 1 motor patrol with 12 ft. blade.

PATROL GRADERS—**Worthington, Minn.**—Mar. 3, by C. J. Kall, aud. Nobles Co., 2 motor patrol graders.

PUMPS, etc.—**Jackson, Miss.**—Mar. 5, by W. C. Trotter, secy. Mississippi Building Comn., furnishing 3 in. centrifugal pump with 25 hp. motor attached also fittings and material required for installation.

Equipment (Continued)

DUST COLLECTOR SYSTEM—**Cleveland, O.** —Feb. 27, by City, dust collector system for asphalt plant.

TRACTOR, etc.—**Cleveland, O.**—Feb. 27, by City, 1 tractor for Cleveland Airport; trucks for Street Repair Dpt.

FOREIGN

Cuba—Cuban-American Manganese Corp. controlled by Freeport Texas Corp., 122 East 42nd St., New York, plans electric steam shovel mining operations; milling, grinding and flotation plant and cintering plant, 1st unit, by day labor and separate contracts. $1,500,000. Private plans. Other units contemplated, maturity indefinite.

Union Socialist Soviet Republics — Soviet Government, c/o Amtorg Trading Co., 261 5th Ave., New York, coal mining, sorting plants, in Ukraine, Siberia, and other locations, by day labor and under technical aid contract. To exceed $10,000,000. Stuart James & Cooke, 17 Battery Pl., New York, engrs.

Commercial Buildings

RESIDENTIAL

BIDS ASKED

Minn., Minneapolis—Minneapolis Columbus Club, Inc., E. J. Loring, chn. Building Com., 642 McKnight Bldg., soon lets contract 12 story, basement, rein-con., brick, stone clubhotel, 12th St. and LaSalle Ave. $1,000,000. Bertrand & Chamberlin, 616 Civic & Commerce Bldg., archts. Noted Feb. 5.

N. Y., Astoria (br. Long Island City) — See "Contracts Awarded."

N. Y., Hollis—See "Contracts Awarded."

N. J., Jamaica—See 'Contracts Awarded."

N. Y., Astoria (sta. Long Island City) — See "Contracts Awarded."

N. Y., Long Island City—See "Contracts Awarded."

N. Y., New York—See "Contracts Awarded."

CONTRACTS AWARDED

Ill., Chicago—Wieboldt Realty Trust Co., general contract 13 story, 90 x 150 x 160 ft., L shaped, rein.-con., brick, stone, Adams and Ashland Aves., to R. C. Wieboldt Co., 1412 West Washington Blvd. Est. $1,500,000.

Md., Betterton—H. L. Reinhold, Jr., archt., 10 South 18th St., Phila., Pa., Royal Swan Hotel, 3 story, basement, 45 x 200 ft., Shoreham Hotel, 5 and 6 story, basement, 45 x 200 ft., and two 2 story, basement, 20 x 150 ft., amusement buildings, connecting arcade, all foregoing brick, rein.-con., plain founds., to I. M. Cirrito & Co., Bryn Mawr, Pa., for Royal Swan Corp., Fuller Bldg., Phila., Pa. Est. $1,000,000. Noted Jan. 1.

N. Y., Astoria (sta. Long Island City) — V. Cononato, 31-13 21st St., Long Island City, 6 story, 34th St. and 30th Ave., separate contracts. $250,000. V. Schiller, 30-64 41st St., archt.

N. Y., Astoria (sta. Long Island City) — Morris Chatham Corp., Chatham Phoenix Bldg., Long Island City, 6 story, 84 x 150 ft., 30th St. and 34th Ave., separate contracts. $250,000. B. Braunstein, 163-18 Jamaica Ave., archt.

N. Y., Hollis—Homelawn Realty Corp., 107-02 103rd Ave., Jamaica, apartments, 115 Ave. and 205th St., separate contracts. $150,000. W. Sandblum, c/o owner, archt.

N. Y., Jamaica—Island Housing Corp., 160-16 Jamaica Ave., 89th St. and 187th Ave., separate contracts. $150,000. A. Allen, 163-18 Jamaica Ave., archt.

N. Y., Long Island City—Hartman Homes, 1851 Willoughby Dr., apartments, Willoughby Ave., separate contracts. $150,000. C. Infanger, 2634 Atlantic Ave., Brooklyn, archt.

N. Y., New York—Academy Constr. Corp., c/o Springsteen & Goldhammer ,archt., 40 East 49th St., apartment, Commonwealth, Lacombe and Rosedale Aves., day labor and separate contracts. $2,000,000.

N. Y., New York—Anniston Realty Corp., 130 West 42nd St., apartment, stores, Morris and Clay Aves., day labor and separate contracts. To exceed $1,000,000. E. L. Larkin, 130 West 42nd St., archt.

N. Y., New York — C. Schurmacher, 102 Maiden Lane, eight 6 story apartment building, 176 East 3rd St., separate contracts. $281,000. Bids after Mar. 1. H. Ginsberg, 205 East 42nd St., archt.

O., Cleveland—South Shaker Building Co., C. Bernstein, Swetland Bldg., 3 story, basement, 80 x 109 ft., brick apartment, to W. Dolin, 810 Swetland Bldg. Est. $200,000.

Wis., Shorewood—Armory Realty, Inc., 196 West Water St., masonry and concrete work for 7 story, 138 x 160 ft. apartment, store, bank, to R. L. Reisinger & Co., 1959 Richards St., Milwaukee, $500,000. Noted May 29.

CLUBS

PROPOSED WORK

Md., Baltimore—Biltmore Holding Co., C. E. Bentley, pres., Emerson Hotel, soon takes bids 12 story, rein.-con., brick, stone, tile club, 219-25 North Calvert St. $800,000. F. A. Fletcher, 517 North Charles St., archt. Noted July 10.

N. J., Jersey City — Knights of Columbus, Council 137, T. J. J. Norton, grand knight, 44 Jersey Ave., 2 story, basement, brick, steel, plain found. $150,000. **Maturity about May.** Kelly & Cowan, 921 Bergen Ave., archts. Noted Feb. 5.

N. J., Jersey City — Y. M. C. A., S. H. Lipscomb, genl. secy., 654 Bergen Ave., 7 story, basement, 100 x 100 ft., brick, steel, rein.-con. building, Fairview and Bergen Aves. $300,000. **Maturity in June.** J. F. Jackson, 137 East 45th St., New York, archt. Noted Nov. 20.

BID ASKED

N. J., Orange—H. B. Marsh, archt., 7 East 48th St., New York, bids about Mar. 15, general contract 2 story, basement, brick, steel building, Oakwood St., for Y.M.C.A., 148 Central Ave. $150,000. Noted Jan. 1.

CONTRACTS AWARDED

Fla., Tampa—Y. W. C. A., Tampa, 4 story building, to W. E. Rubush, 501 Morgan St. Est. $150,000.

Pa., Bradford—T. K. Hendryx, archt., 301 Terminal Bldg., general contract 5 story, basement, 82 x 96 ft., brick, steel, stone club, store, office building, to Warren Constr. Co., Gokey Bldg., Jamestown, N. Y.; for Tuna Lodge 411, I.O.O.F., J. Polly, chn. building comn., 111 High St. Est. $175,000. Noted Jan. 22.

HOSPITALS

PROPOSED WORK

Mass., Boston — City, Institutions Dept., sketches by McLaughlin & Burr, 88 Tremont St., Boston, 2 story recreation building, at Long Island Hospital. $200,000.

Mass., Pittsfield—St. Luke's Hospital, M. J. Leonard, 27 Onota St., maternity building, hospital unit, East St. $150,000-$200,000. Architect not selected.

Mass., Pittsfield—St. Luke's Hospital, M. J. Leonard, 27 Onota St., nurses home, East St. $150,000 or more. Architect not selected.

Mass., Roxbury (sta. Boston)—New England Baptist Hospital Corp., 85 Parker Hill Ave., revised plans by Kendall, Taylor & Co., 209 Columbus Ave., Boston, 4 and 1 story, basement, brick hospital addition. $200,000. Noted June 19.

Mass., Westboro — Commonwealth of Massachusetts, Dpt. Mental Diseases State House, Boston, hospital additions. $150,000. Architect not selected.

N. Y., New York — New York Orthopaedic Hospital, 420 Lexington Ave., plans by York & Sawyer, 100 East 42nd St., 5 story hospital addition, 419 East 58th St. $300,000.

BIDS ASKED

N. J., Clinton—Mar. 6, by C. N. Leathem, Jr., state archt., State Bldg., Trenton, 3 story, brick, steel hospital at State Reformatory for Women, for Dpt. Institutions & Agencies, Trenton. $150,000.

N. Y., Albany—Berlin & Swern, archts., 228 North LaSalle St., Chicago, bids about Mar. 1, general contract 6 story nurses' home, for Albany Hospital. $350,000. Noted Oct. 16.

N. Y., Pine Aire Station—Mar. 18, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, continued treatment group buildings, at Pilgrim State Hospital.

N. Y., West Haverstraw—Mar. 26, by Div. Standards & Purchase, Capitol, Albany, general contract 2 ward buildings at New York State Reconstruction Home.

N. Y., Wingdale—Mar. 25, by Dpt. Mental Hygiene, State Office Bldg., Albany, continued treatment group buildings at Harlem Valley State Hospital.

CONTRACTS AWARDED

Ark., De Witt—State Building Comn., Little Rock, (1st unit) hospital, incl. 4 dormitories assembly, kitchen, cafeteria, Colonial design architecture, at State Hospital for Nervous Diseases, to W. Peterson, Donoghey Bldg., Little Rock, $327,500.

Ill., Bloomington—Mennonite Hospital Assn., 807 North Main St., general contract 3 story, basement, 60 x 120 ft., rein.-con., brick, steel plain found., day labor. Lunden, Hooten-Roozen-Schaefer, archts., Peoples Bank Bldg., will award contracts for plumbing, heating, wiring. $220,000. Noted Dec. 25.

Ind., Indianapolis — Riley Hospital, West Michigan St., general contract 2 story, basement, 75 x 150 ft., rein.-con., brick, stone hospital for children, Rotarian Unit, to L. Colvin.

Kan., El Dorado—Susan B. Allen Memorial Hospital Assn., L. D. Hadley, secy., general contract 3 story, basement, 42 x 122 ft. concrete, rein.-con. brick, stone, tile, to G. Walker, Salina, $79,700; heating and plumbing, to Clark & Smith, Sedgwick Bldg., Wichita, $24,915; electric wiring, to Craiglow Electric Co., El Dorado, $4,850. Grand total $109,456. Noted Jan. 15.

Mass., Westboro and Foxboro—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, 2 story, basement, 90 x 155 ft., brick, steel farm dormitory buildings, plain founds., at Foxboro, to S. Bordiere, 279 Lexington St., East Boston, $98,700; 2 story, basement, 95 x 150 ft., brick, steel, farm dormitory buildings, plain founds., at State Hospital, Westboro, to F. Losordo Co., 24 School St., Boston, $95,299. Noted Jan. 22.

Missouri—School Sisters of Notre Dame, c/o M. Jolendis, 320 West Ripa St., St. Louis, 3 story, basement, 33 x 75 x 36 x 71 x 48 x29 x 30 x 108 x 30 x 29 x 46 x 48 x 29 x 56 ft., infirmary buildings, near Spanish Lake, in Northern part St. Louis Co., to Mississippi Valley Constr. Co., Wainwright Bldg., St. Louis.

CHURCHES

PROPOSED WORK

Conn., Bridgeport — Holy Rosary Roman Catholic Parish, A. Daly, pastor, plans by De Pace & Juster, 151 West 46th St., New York, 1 story, basement, 60 x 110 ft., brick, granite, limestone, cast stone, Harriet St. and East Washington Ave. $150,000.

Conn., Newtown—St. John's Episcopal Parish, sketches by O. Wilkins, Post Office Arcade, Bridgeport, 1 story, basement church. $150,000.

Ind., Indianapolis—Presbyterian Church, 721 Peoples Bank Bldg., plans by A. A. Honeywell, 920 Architects & Builders Bldg., Sunday school addition Memorial Presbyterian Church, 11th St. and Ashland Ave. $150,000.

Ia., Des Moines — First Church of Christ, Scientist, Grand Ave. and 38th St., plans by Proudfoot, Rawson, Souers & Thomas, 810 Hubbell Bldg., 2 story, basement, concrete, brick, stone, Grand Ave. and 38th St. $175,000.

N. J., Hoboken — St. Peter's & St. Paul's Roman Catholic Church, F. E. Bogner, pastor, 404 Hudson St., will not build 2 story, basement, brick, steel sister home, 416 Hudson St. $150,000. Project abandoned. Architect not selected.

N. J., Irvington (br. Newark) — Methodist Episcopal Church, R. L. Luerich, pastor, 64 Myrtle Ave., 2 story, basement, brick, steel. $250,000. Project in abeyance. N. Hulme, 1524 Chestnut St., Phila., Pa., archt. Noted Feb. 12.

N. J., Keyport—Calvary Methodist Episcopal Church soon lets general contract altering and constructing 2 story, basement, brick, steel addition, plain found., 3rd and Osborne Sts. $150,000. J. N. Pierson & Son, 198 Jefferson City, Perth Amboy, archts.

N. J., Union City—St. Michaels Monastery, E. Goggan, pastor, 381 West St., Union City, altering 1 story, basement monastery, West St. $150,000. **Maturity probably in May.** Ntoed Jan. 22.

O., Shaker Heights (br. Cleveland)—Shaker Heights Christian Church, A. J. Culler, pastor, 2422 Woodmere Rd., Cleveland Heights, 1 story, brick, steel, concrete church. $200,000. Architect not selected.

Pa., Erie—Our Lady of Charity, J. M. Cannon, pastor, 205 West 9th St., plans by W. T. Monahan, Palace Hardware Bldg., 2 and 3 story, 180 x 248 ft., concrete, steel, brick monastery, chapel and dormitory building, East Lake Rd. $300,000.

BIDS ASKED

N. J., Jersey City—J. Armstrong, archt., 26 Gautier Ave., bids about May 15, general contract 3 story, basement, 50 x 100 ft., brick, steel, Atlantic St., for Monumental Baptist Church, W. S. Smith, 18 Atlantic St. $150,000. Noted Sept. 18.

N. J., Perth Amboy — CONVENT — G. W. Brooks, archt., 216 Smith St., bids about June 1, general contract 3 story, basement, brick, steel convent, for St. Mary's Roman Catholic Church, c/o architect. $150,000.

Ont., Ottawa—Dominican Order, bids about Apr. 1, rebuilding brick, rein.-con., stone church to replace St. Jean Baptiste Church, plain found., Primrose Ave., recently destroyed by fire. $350,000. J. A. Larue, 559 Durocher St., Montreal, Que., archt.

CONTRACTS AWARDED

Mass., Cambridge — St. Peters Episcopal Church, F. C. Lawrence, pastor, 15 Clinton St., 3 story, basement, brick, steel parish house, plain found., to W. Fillmore Co., Inc., 25 Cherry St. Est. $150,000. Noted Sept. 4.

SCHOOLS

PROPOSED WORK

Ark., Jonesboro — State Agricultural & Mechanical College, V. C. Kays, pres., sketches 3 story, rein.-con., brick, stone administration building, incl. laboratories, auditorium, chapel. $250,000 incl. equipment. Architect not selected.

Calif., Pasadena — Pasadena Junior College Dist., North Brasse St., 4 new Junior College buildings, incl. science, music hall library, student union buildings. Election $1,000,000 bonds for same.

Conn., Hartford — St. Augustine's Roman Catholic Parish, M. W. Barry, pastor, plans by Whiton & McMahon, 805 Main St., two 1 story 12 x 125 ft. church additions, also parochial school, Clifford St. two exceed $150,000.

Conn., Waterbury—St. Ann's Roman Catholic Church, E. A. Lamontagne, pastor, and T. G. O'Connell, archt., 134 Newbury St., Boston, Mass., soon lets contract 3 story, basement, 70 x 155 ft., brick, stone, steel, elementary parochial school, plain found., East Clay St. To exceed $150,000; heating, plumbing electrical work, $25,000 or more.

Ill., Peoria—Peoria School Bd., 300 North Monroe St., plans by Hewitt Emmerson & Gregg, Peoria Life Bldg., Junior High School, Warren and Eckley Sts. **Maturity this fall.**

Ill., Springfield—Catholic Bishop of Springfield plans by J. W. McCarthy & Co., 139 North Clark St., Chicago, T shaped, brick, stone boys' school.

Ind., East Chicago—School Comrs., plans by Wainwright & Wilkins, 507 Lloyd Bldg., Hammond, rein.-con., brick, steel, stone high school, incl. gymnasium, domestic science. $150,000.

Ind., Rochester—Bd. Schools Comrs. plans by S. Parcell, Rochester, McKinley Grade School, steel, brick. $150,000.

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Schools (Continued)

Ind., Rockville—Bd. School Comrs. plans by H. L. Fillinger, Dana, steel, brick high school, gymnasium, grade school. $150,000.

La., New Orleans — City of New Orleans plans by W. R. McCornack, 10006 Carnegie Ave., Cleveland, O., 3 story, basement, brick, steel concrete industrial college. $500,000.

Md., Baltimore—Mottu & White, archts., Baltimore Trust Bldg., soon let contract 2 story, basement, stone, irregular sized, stone school, Charles St. and Wyndhurst Ave., for Friends School, W. S. Pike, headmaster, Park Ave. and Laurens St. $175,000. Noted Dec. 25.

Mass., Boston—City, Dpt. School Buildings, plans by C. R. Greco, 11 Beacon St., 3 story, basement, brick, limestone, steel school, plain found., Charter St., North End, Boston Proper. $400,000.

Mass., Cambridge—Harvard University, A. L. Lowell, pres., sketches by Coolidge, Shepley, Bulfinch & Abbott, Ames Bldg., Boston, 1 story, basement, brick, granite, limestone, steel memorial chapel, College Grounds. $1,000,000.

Mass., Chelmsford — Town, N. Picken, chn. com., altering and constructing 2 story, basement, brick high school addition, Billerica St. $150,000 or more. Architect not selected.

Mass., Fitchburg — Commonwealth of Massachusetts, State House, Boston, Bd. Educ., P. Smith, practical arts building at Normal School. $160,000. Architect not selected.

Mass., Lincoln—Town Bd. Selectmen, C. T. Todd, 2 story, basement, brick high school, Lincoln Center. $150,000. Architect not selected.

Mass., Malden (br. Boston)—City, W. A. Hastings, mayor, City Hall, 2 story, basement, brick, stone school, Forest Dale, Sect. To exceed $150,000. Architect not selected.

Mass., Norwood—St. Catherine's Roman Catholic Church, J. F. Doherty(pastor, Nahatan St., plans by McLaughlin & Burr, 88 Tremont St., Boston, altering and constructing 2 story, basement, brick, steel addition to parochial school, concrete found., 249 Nahatan St. $150,000. Noted Oct. 30.

Mass., Richmond — Town, E. F. Davenport, supt. schools, 2 story, basement, brick high and grade school. $150,000 or more. Architect not selected.

Mass., Seekonk—Town, Building Com., H. L. Whitman, supt. schools, Junior High School, 2 story, basement, brick. $150,000. Architect not selected.

Mass., Westport—Town, C. T. Gifford, chn. School Comn., 2 story, basement, new buildings or addition to Senior High School. $150,000 or more. Architect not selected.

Mass., West Springfield (br. Springfield) — Town, J. R. Fausey, supt. schools, 46 Cooper St., vocational school. $150,000-$200,000. Architect not selected.

Minn., Duluth—Bd. Educ., surveys Morgan Park High School addition. $200,000.

Minn., Moorhead — State Comn. Administration & Finance, H. W. Austin, comr. Purchase, State Capitol, St. Paul, plans by C. H. Johnston, 360 Robert St., St. Paul, main recitation and physical education building, $420,000; demonstration school, $220,000, both at Teacher State College.

Mo., St. Louis—Bd. Educ., 911 Locust St., bids in spring or early summer, 3 story, brick, concrete grade school, Bowen St. and Wilmington Ave., $360,000; 3 story, basement high school, Kingshighway Blvd. and Arsenal St., $900,000. E. T. Friton, c/o owner, building comr.

Mo., Joplin—Bd. Educ., c/o R. Breazeale, secy., 827 Pearl St., sketches by T. W. Williamson, 312 Farmers Natl. Bldg., Topeka, Kan., North Junior High School, 2 story, basement, brick, rein.-con., Gray Ave. and 1st St. $250,000. Noted Mar. 20.

N. J., Englewood—Bd. Educ., 11 Engle St., **3 story, basement, brick, steel, rein.-con. high school on Lexow property.** $800,000. Former project abandoned. Architect not selected. Noted June 19.

N. J., Fairlawn—Bd. Educ., will not build 2 story, basement, brick, steel Henderson Terrace and Highview Ave. $150,000. Project abandoned. Noted Feb. 19.

N. J., Fairview — Bd. Educ., O. Kuenzler, Lincoln School, revised sketches by R. Cadien, 545 Gorge Rd., Cliffside, Junior High School, 2 story, basement, brick, steel. $150,000. Noted Oct. 23 Daily.

N. J., Little Ferry — Bd. Educ., J. Cronin, pres., Boro Hall, will not build Washington School, 2 story, basement, brick, steel. $150,000. Project abandoned. Hacker & Hacker, 201 Main St., Fort Lee, archt. Noted Jan. 15.

N. J., Lodi—Bd. Educ., A. Cody, pres. Wilson School, 2 story, basement, brick, steel school. $150,000. **Maturity probably soon.** Architect not selected.

N. J., Long Branch—Bd. Educ. sketches by H. I. Braun, 501 Harrison St., 2 story, brick, steel school addition, Bway. $150,000.

N. J., Middlebush—Bd. Educ. Franklin Twp., R. W. Thompson, chn. Buildings & Grounds, 2 story, basement, brick, steel school, plain found. $150,000. **Maturity probably soon.** Architect not selected.

N. J., New Milford—Bd. Educ., New Milford, will not build 2 story, basement, brick, steel addition to Steuben School, River Rd. $150,000. Project abandoned. Architect not selected. Noted Oct. 9.

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N. J., Piscataway—Bd. Educ., Raritan Twp., Piscatawaytown School, 2 story, basement, brick, steel. $200,000. **Maturity probably in May.** A. Merchant, 1 Elm Row, New Brunswick, archt. Noted Feb. 5.

N. J., Springfield — Bd. Educ., Short Hills Ave., plans by J. T. Simpson, 45 Walnut St., Newark, 2 story, basement, brick, steel high school. $300,000. Noted Aug. 4 Daily.

N. J., Totowa—Bd. Educ., School Bldg., will not build 2 story, basement, brick, steel, plain found. $150,000. Project abandoned. Architect not selected. Noted Dec. 4.

N. J., Union City—Bd. Educ., 415 32nd St., 3 story, basement, brick, steel, rein.-con., plain found., West St. between 5th and 6th Sts. $850,000. **Maturity about May.** J. D. Lugosch, 714 Bergenline Ave., archt. Noted Jan. 29.

N. Y., Grymes Hill (mail Staten Island) — Academy of Our Lady of Blessed Sacrament, sketches by Sibley & Fetherston, 205 East 42nd St., New York, 2 story, brick, steel, rein.-con. high school, Howard Ave. $150,000 or more.

N. Y., New York—Bd. Higher Education, c/o Hunter College, Park Ave. and 68th St., plans by Thompson, Holmes & Converse, 101 Park Ave., administration building for Hunter College, Jerome Park Reservoir. $4,000,000.

Pa., Phila.—Temple University, C. E. Bemry, pres., Broad and Montgomery Sts., Thomas B. Sullivan Memorial Library, Broad and Montgomery Sts. $280,000. Architect not selected.

Pa., Springdale—Bd. Educ., R. L. Harrison, chn. Property Comn., 366 School St., sketches brick, steel high school, incl. auditorium. Election in May, $150,000 for same. Architect not selected.

R. I., East Providence (br. Providence) — Town, J. R. D. Oldman, supt. schools, Senior High School. $200,000. Architect not selected.

Tenn., Nashville—State of Tennessee, sketches by W. R. McCornack, 1006 Carnegie Ave., Cleveland, O., group school buildings, incl. administration, auditorium, men's and women's dormitories, gymnasium, agricultural and farm group buildings. $1,000,000.

Ont., Kingston—Bd. Educ. brick, steel, concrete, stone technical school. $350,000. Architect not selected.

Ont., Toronto—Bd. Educ., 155 College St., plans by C. Dyson, 155 College St., 3 story, basement addition to Danforth Technical School $215,000, 2 story addition for shops, Central Technical School $115,500, 3 story, basement addition to High School of Commerce $115,000, all foregoing concrete, brick, stone, steel.

BIDS ASKED

Mo., Clayton—Mar. 2, by Bd. Educ., J. J. Bracken, supt., 7500 Maryland Ave., altering and constructing 2 story, basement, 45 x 65 x 70 x 109 ft. rein.-con., brick addition to Glenridge School, $110,000; and 2 story, basement, 36 x 78 x 49 x 150 ft. rein.-con., brick addition to Bellevue School, $78,000. W. B. Ittner, Inc., Continental Life Bldg., St. Louis, archts. Noted Jan. 22.

N. J., Irvington (br. Newark)—Bd. Educ., 1253 Clinton Ave., bids about Mar. 15, general contract altering and constructing 2 story, basement, brick, steel, school addition, Grove St. $150,000. Schneider, Kleeman & Werther, 1007 Broad St., Newark, archts. Noted Feb. 19.

N. J., Wyckoff—Bd. Educ., School Building, **bids about Mar. 15**, general contract 2 story, basement, brick, steel, rein.-con., plain found., **Grand View Ave.** $150,000. Lee & Hewitt, **152 Market St., Paterson**, archts.

N. Y., Batavia—Mar. 26, by Superintendent Dpt. Standards, Capitol, Albany, dormitory, New York State School for Blind. Noted Jan. 8.

Pa., Phila.—Girard College, Corinthian and College Aves., bids about Apr. 17, chapel for college. $2,000,000. Thomas Martin & Kirkpatrick, 220 South 16th St., archts.

N. Y., Oswego — Mar. 12, by Commissioner State Educ., Dpt., Education Bldg., Albany, industrial teachers training building, at State Normal School; adv. E. N.-R. Feb. 26. Noted Feb. 12.

N. Y., Warwick—Mar. 26, by Commissioner Dpt. Social Welfare, State Office Bldg., Albany, 28 buildings at New York Training School for Boys.

Wis., St. Francis — Pio Nono College bids about Apr. 1, 3 story, basement, 200 x 260 ft. brick, rein.-con. dormitory. P. Brust, 135 West Wells St., Milwaukee, archt.

Va., Charlottesville—J. K. Peebles, chn. Architectural Comn., Law Bldg., Norfolk, taking bids 2 story ,basement, 200 x 207 ft., brick, steel, concrete law building for University of California. $1,000,000. Noted May 8.

Ont., Ottawa—Dominican Order, Ottawa, bids about June 1, rebuilding rein.-con. convent, Lorne Ave., recently destroyed by fire. $250,000. J. A. Larue, 559 Durocher St., Montreal, Que., archt.

CONTRACTS AWARDED

Calif., La Jolla—L. J. Gill, archt., Sefton Bldg., San Diego, general contract Scripps Institute of Oceanography, 2 story, 48 x 100 ft., rein.-con. laboratory for University of California, 405 Hilgrade Ave., to Jarboe Constr. Co., San Diego, $63,000; plumbing and heating, to Lohman Bros., 232 South Spring St., Los Angeles, $25,916; electrical work, to Capital Electric Co., 3833 5th St., San Diego, $7,000; refrigerating, to Baker Ice Machine Co., 351 South Anderson St., Los Angeles, $12,290; furniture, to Sheldon Co., Box 226 Corte Madera, $18,100. Grand total $126,306. Noted Jan. 29.

Calif., Oakland—H. A. Minton, archt., Bank of Italy Bldg., San Francisco, group rein.-con school buildings, to J. L. McLaughlin, 251 Kearny St., San Francisco, $300,000. Noted Jan. 22.

Ind., Lebanon—Bd. School Comrs., general contract 2 story, basement, brick, steel, to A. J. Wolfe Constr. Co., Logansport; heating and plumbing, to J. J. Barnhart, Wilkinson. Est. $150,000. Noted Jan 22.

N. Y., New Rochelle—Bd. Educ., High School Bldg., general contract altering and constructing 3 story, basement, brick, steel high school addition, Woodrow Wilson Dr. between Clove Rd. and Flandran Ave., to J. W. Ryan, 18 East 41st St., New York, $269,133; plumbing, to J. Winkel Co., 66 Larchmont Ave., Larchmont, $15,398; heating, to D. J. Rice, 4150 38th St., Long Island City, $37,400; electrical work, to Carroll Ratner Corp., 447 Main St., $26,570. Grand total $348,501.

Wis., New London—Bd. Educ., general contract 2 story, basement, brick, steel high school, to W. H. Farley, New London, $177,098; heating and plumbing, to J. E. Robertson, Wauwatosa, $36,739; electrical work, to Pribnon Electric Co., New London, $9,166; terrazzo, tile, marble, to Art Mosaic Tile Co., Green Bay, $14,566. Grand total $237,569. Noted Jan. 1.

THEATRES

PROPOSED WORK

Mass., Brookline (br. Boston)—G. W. Wightman, 3 Charles St., plans by Rapp & Rapp, 1501 Bway., New York, theatre, store, office, parking ground, Beacon and Harvard Sts. and Sewell Ave. $150,000. Paramount Famous Lasky Corp., 58 Berkley St., Boston, lessee. Noted Jan. 22.

Mass., East Boston (sta. Boston)—Broadway Strand Co., J. H. Doyle, 420 Broadway, South Boston, sketches by J. F. Cullen, 162 Newbury St., Boston, rebuilding 1 and 2 story, basement, brick, steel theatre, store, office and bowling alley building, 985 Bennington St., recently destroyed by fire. $150,000-$160,000.

Mich., Wyandotte—Wyandotte Theatre Corp., H. Roehrig, pres., Wyandotte, 3 story, basement, 120 x 135 ft., brick, rein.-con., steel theatre, office, plain found., Biddle and Maple Aves. $500,000.

Tex., Longview—East Texas Theatres, Inc., Beaumont, theatre. $150,000.

BIDS ASKED

N. Y., New York—Empire Square Realty Co., 1947 Bway., bids about Mar. 1, separate contracts rebuilding theatre, office, Bway. and 66th St., destroyed by fire. To exceed $500,000. Private plans. Loews Theatres, 1540 Bway., lessee.

BANKS

PROPOSED WORK

Conn., New Haven — Connecticut Savings Bank, B. Mansfield, pres., sketches bank addition, Crown and Church Sts. $150,000 or more. Private plans.

N. J., Madison—Madison Trust Co., Main St., sketches 1 story, basement, brick steel bank, plain found., 18-22 Waverly Ave. $150,000.

N. J., Newark—S. D'Auria & Sons, 139 7th Ave., plans by A. S. Miller, 1774 Carroll St., Brooklyn, brick, steel bank, Clay and Broad Sts. $150,000. Noted Feb. 19.

N. J., Paterson—Owner, c/o H. B. Crosby & A. E. Slieght, archts., 125 Ellison St., sketches 2 story, basement, brick, steel bank, Bway. and West Bway. $150,000.

N. Y., Brooklyn—Brevoort Savings Bank, 522 Nostrand Ave., bank addition, office, Fulton St. near Nostrand Ave. To exceed $150,000. **.Maturity indefinite.**

OFFICES

PROPOSED WORK

Ill., Chicago—Graham, Anderson, Probst & White, archts., 80 East Jackson Blvd., soon **takes bids (1st unit)** 42 story, basement, 100 x 138 ft., rein.-con., brick, steel, stone office, store, La Salle and Adams Sts., for Marshall Field Estate, 231 South La Salle St. $5,000,000. Noted Oct. 17.

N. J., Hackensack—H. C. Harper & F. W. Bogert, 37 Huyler St., 2 story, brick, steel office, 309 State St. $150,000. **Maturity probably soon.** Architect not selected.

N. J., Newark—Owner, c/o Y. Matsui, archt., 101 Park Ave., New York, 2 story, basement, brick, steel office, loft, Park Pl. and Passaic River. $8,000,000. Project in abeyance. Noted Nov. 13.

N. Y., New York—Carbide & Carbon Realty Co., 30 East 42nd St., plans by Shreve, Lamb & Harmon, 11 East 44th St., altering and constructing office, bank addition, in vicinity 30 East 42nd St. $150,000.

N. Y., New York—New York Dock Trade Facilities Corp., subsidiary New York Dock Co., 44 Whitehall St., office, Bway., Cortlandt, Church and Dey Sts. To exceed $15,000,000. **Maturity about 1932.**

O., Akron — Allied Engineers, archts. and engrs., 283 Buckeye St., soon let contract 2 story brick, steel, concrete top addition, to office building, North Main St., for Ohio Edison Co., c/o A. E. Blinn, genl. mgr., Terminal Bldg. $350,000.

Offices (Continued)

BIDS ASKED

N. J., Newark — F. A. Phelps, archt., 21 Fulton St., bids about Apr. 1, general contract 3 story, basement, brick, steel office, Washington Pl. and Halsey St., for Eagle Fire Insurance Co., F. W. Fort, genl. mgr., 718 Washington Pl. Est. $150,000. Noted Feb. 5.

N. Y., New York—Corporation, c/o W. W. Ahleshlager, archt., 565 5th Ave., bids about May 1, general contract office, stores, 6th Ave. and 41st St. To exceed $1,000,000. Private plans. Noted Jan. 8.

CONTRACTS AWARDED

Calif., Pasadena — Pasadena Medical Dental Building Assn., 8 story, basement, rein.-con. office, to Austin Co. of California, 777 East Washington St., Los Angeles, $340,000.

Minn., St. Paul—Davidson Co., 1315 Pioneer Bldg., general contract 11 story, basement, brick, limestone, rein.-con. office addition, 6th and Minnesota Sts., to Foley Bros. Co., 209 Gilfillan Blk. Est. $250,000.

Tex., Longview—Longview Investment Co., Monroe, La., 8 story, brick, rein.-con., steel office, to W. M. Weiner, Shreveport, La. Est. $400,000.

STORES

PROPOSED WORK

Mass., Everett (br. Boston) — Owner, c/o C. F. Springall, archt., 50 Park St., Malden, sketches 3 story, basement, brick store, apartment, plain found., Broadway and Parker St. $150,000.

N. J., Jersey City—Esskay Co., Inc., S. Kleinhaus, pres., 100 Newark Ave., will not build 10 story, basement, 35 x 225 ft., brick, steel, rein.-con. department store, office, Magnolia Ave. and Hudson Blvd. $250,000. Project abandoned. Noted Feb. 20, 1930.

N. J., Newark—Owner, c/o E. A. McMurray, archt., 350 Millburn Ave., Millburn, revised sketches 2 story, basement, brick, steel store, apartment, 18th and Melrose Aves. $200,000. Noted Feb. 5.

BIDS ASKED

La., New Orleans—Mar. 3, by M. H. Goldstein, archt., Amer. Bank Bldg., 4 story, basement, 100 x 200 ft., rein.-con., limestone wood pile found., Baronne St., for J. K. Feiblemen Realty Co., 717 St. Peter St. $500,000.

N. J., Newark—W. E. Lehman, archt., 972 Broad St., bids about Mar. 15, general contract 2 story, basement, brick, steel store, apartment, plain found., Clinton and Hillside Aves., for Bratter & Pollak, 972 Broad St. Est. $150,000. Noted Feb. 19.

N. J., Perth Amboy—Maple Realty Co., 169 Smith St., taking bids general contract 2 story, basement, brick, steel store, office, plain found., Hobart St. $150,000. Griesen & Tuzik, 175 Smith St., archts. Noted Feb. 19.

CONTRACTS AWARDED

Calif., Modesto—Kress Co., Western Pacific Bldg., Los Angeles, 2 story, basement, 60 x 150 ft., brick department store, 10th St., to K. E. Parker, 135 South Park St., San Francisco, $150,000.

Calif., Oakland — J. Breuner Co., 15th and Clay Sts., 8 story, basement, Class A rein.-con. store, 21st St. and Bway., to P. J. Walker Co., Sharon Bldg., San Francisco, $1,000,000. Noted Feb. 5.

LOFTS

BIDS ASKED

N. J., Newark — J. Centanni, archt., 142 Market St., bids about Mar. 15, general contract 3 story, basement, brick, steel addition to loft, plain found., for Owner, c/o architect. Noted Feb. 12.

CONTRACTS AWARDED

N. Y., New York — Trinity Church, G. F. Crane, controller, 52 Wall St., 15 story loft, storage, store, 157 Chambers St., to One Fifty-Seven Chambers Street Corp., 160 Varick St. Est. exceeds $1,000,000. Contractor soon takes bids on separate contracts.

PUBLIC

PROPOSED WORK

Conn., Waterbury—COURT HOUSE—Waterbury Co. Comn., Court House, F. Waters, Middlebury, court house addition, Leavenworth St. $200,000. Architect not selected.

Mass., Franklin — MUNICIPAL and COURT HOUSE — Town, E. S. Cook, chn. Bd. Selectmen, municipal building, court house. To exceed $150,000. Architect not selected.

Mass., South Boston (sta. Boston)—FIRE STATION—City of Boston, Fire Dpt., Bristol St., Boston, 2 story, basement, brick, steel, City Point. $350,000 appropriated. Architect not selected.

Mass., Wellesley — MUNICIPAL — Town, I. Sprague, chn. comn., municipal building. To exceed $150,000. Architect and site not selected.

Minn., Duluth—JAIL—See "Sewers."

Mo., St. Louis — POLICE STATION — Bd. Police Comrs., 12th St. and Clark Ave., plans by Klipstein & Rathmann, 316 North 8th St., 2 story, basement, 112 x 134 ft. rein.-con., brick, stone, Kansas Ave. and Colorado St. $150,000. Noted Apr. 17.

N. H., Concord—JAIL—Merrimack Co., A. Britton, 12 North Main St., county jail. To exceed $150,000. Architect not selected.

N. J., East Newark—MUNICIPAL—Bd. Boro Council, J. Reynolds, mayor, Boro Hall, 2 story, basement, brick, steel. $150,000. **Maturity 1932.** Architect not selected. Noted Feb. 12.

N. J., Jersey City—HALL of RECORDS—Bd. Freeholders Hudson Co., Court House, plans by J. T. Rowland, Jr., 26 Journal Sq., 16 story, basement, brick, steel, Newark Ave. Noted Nov. 13.

N. J., Jersey City—MEDICAL CENTER—Bd. City Comrs., City Hall, will not alter medical center, Baldwin Ave. $150,000. Project abandoned. J. T. Rowland, Jr., 26 Journal Sq., archt. Noted Dec. 25.

N. J., Perth Amboy—FIRE HOUSE—Bd. City Comrs., City Hall, brick, steel. $150,000. **Maturity probably soon.** Architect not selected.

N. J., Tenafly—BORO HALL—Bd. Boro Council, boro hall addition. $150,000. **Maturity probably soon.**

N. Y., Astoria—HEALTH CENTER—Dpt. Health, 505 Pearl St., bids late in April baby health center. $150,000. Noted Feb. 19.

N. Y., Brooklyn—HEALTH CENTER — Dpt. Health, 505 Pearl St., New York, bids late in April, baby health center, Williamsburg Dist. $150,000. J. Woolf, 505 Pearl St., engr. Noted Feb. 19.

N. Y., Flushing—HEALTH CENTER—Dpt. Health, 505 Pearl St., New York, baby health center, X-ray laboratories, dental clinic. To exceed $150,000. **Maturity indefinite.** Architect not selected.

N. Y., St. George—HEALTH CENTER—Dpt. Health, 505 Pearl St., New York, bids late in April, general contract health center. $150,000. Noted Feb. 19.

BIDS ASKED

Mass., Stoneham — LIBRARY — Mar. 3, by Coolidge & Carlson, archts., 89 State St., Boston, altering and constructing 1½ story, basement, brick, limestone library addition, plain found., Main St., for Town, R. H. Richardson, Town Hall. $150,000. Noted Oct. 23.

N. J., Menlo Park — VETERAN'S HOME — State Bd. Institutions & Agencies, W. J. Ellis, comr., State Office Bldg., Trenton, new bids about Feb. 28, general contract, New Jersey War Veterans' Home, 3 story, basement, brick, steel. ●$500,000. J. E. Brinley, 156 5th Ave., New York, assoc. archt. Div. Architecture & Constr., State Office Bldg., Trenton, archts. Noted Feb. 5.

N. Y., Matteawan—WARD—Mar. 31, by Commissioner Dpt. Correction, State Office Bldg., Albany, constructing ward, female group, communicating corridor, auditorium and chapel, Matteawan State Hospital. Noted Feb. 12.

N. Y., St. George—BORO HALL—J. A. Lynch, pres. Richmond Boro, Boro Hall, bids about June 1, altering and constructing addition. $575,000. F. Wall, 576 Oakland Ave., West New Brighton, archt. Noted Feb. 19.

N. Y., Syracuse—ARMORY—Mar. 24, by Adjutant General Div. Military and Naval Affairs, Capitol, Albany, armory addition. Noted Jan. 22.

CONTRACTS AWARDED

N. Y., Bath—JAIL—Bd. Supervs. Steuben Co., general contract jail, to Morse Constr. Co., Buffalo, $141,500; heating and plumbing, to M. G. Lippincott, Hornell, $42,866. Noted May 22.

N. J., Glen Ridge—MUNICIPAL—Bd. Boro Council, Boro Hall, general contract 2 story, basement, brick, steel, plain found., to Auf der Heide Contg. Co., 443 16th St., West New York, $147,950; plumbing, to A. R. Gasewind, 1060 Broad St., Newark, $10,747; heating and ventilating, to G. Stewart, 270 South 20th St., Newark, $16,856; electrical work, to Badaracco Bros. & Co., 403 Washington St., Hoboken, $8,371. Grand total $183,926. Noted Jan. 29.

N. Y., Elmira—REFORMATORY—Dpt. Correction, State Office Bldg., Albany, general contract school and hospital at Elmira State Reformatory, to M. A. Long Co., Allentown, Pa., $202,540; heating and sanitary work, to Barr & Creelman Co., 74 Exchange Pl., Rochester, $26,379 and $16,386 respectively; electrical work, to M. Gleason, 239 Water St., Binghamton, $7,346. Grand total $252,651. Noted Dec. 25.

N. Y., Long Island City—COURT HOUSE—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., general contract magistrates and municipal court, to C. A. Williams Co., Inc., 100 East 42nd St., New York, $316,300; heating, to D. J. Rice, Inc., 41-50 38th St., $15,600; electrical work, to Lowy & Donnath, 6-7 West 43rd St., New York, $4,890. Grand total $336,790. Noted Jan. 21 Daily.

UNCLASSIFIED

PROPOSED WORK

Mass., Cambridge—EXCHANGE—New England Telephone & Telegraph Co., 50 Oliver St., Boston, exchange, Ware St. To exceed $150,000. Architect not selected. F. A. Benham, 50 Oliver St., Boston, engr.

Mass., Cambridge—MEMORIAL—City, R. H. Russell, mayor, City Hall, war memorial building, Mass. Ave., Cambridge and Peabody Sts. $1,000,000. Architect not selected.

Mo., Kansas City—EXCHANGE—Southwestern Bell Telephone Co., 11th and Pine Sts., St. Louis, soon takes bids Hiland Jackson Exchange Building, 2 story, basement, 104 x 140 ft., brick, concrete, 63rd and Holmes Sts. W. J. Knight & Co., Wainwright Bldg., St. Louis, engrs. I. R. Timlin, 1916 Telephone Bldg., St. Louis, archt.

N. J., Penns Grove — EXCHANGE — New Jersey Telephone Co., 540 Broad St., Newark, 2 story, basement, brick, steel, $150,000. Project abandoned. Noted Feb. 5.

O., Youngstown — ART GALLERY — City 2 new wings to Joseph G. Butler, Jr. Art Gallery. $150,000.

Pa., Phila. — STATION — Baltimore & Ohio R.R. Co., Baltimore, Md., H. A. Lane, ch. engr., Reading R.R. Co., Reading Terminal Bldg., Reading, C. Dillenbach, ch. engr., and Lehigh Valley R.R. Co., 143 Liberty St., New York, G. T. Hand, ch. engr., union station, on site Old Baldwin Locomotive Wks. To exceed $5,000,000. **Maturity indefinite.**

Tex., Fort Worth — PASSENGER and FREIGHT TERMINALS — Gulf Colorado & Santa Fe R.R., K. B. Duncan, ch. engr., Galveston, brick, steel passenger terminal, $600,000-$750,000; 2 story, 45 x 50 ft., brick, steel freight terminal, $250,000.

BIDS ASKED

N. Y., Buffalo—EXCHANGE—Mar. 4, by New York Telephone Co., 44 Church St., general contract telephone exchange, Elmwood Ave. Voorhees, Gmelin & Walker, 101 Park Ave., New York, archts. Noted Feb. 12.

CONTRACTS AWARDED

Calif., Los Angeles—NEWSPAPER PUBLISHING PLANT and OFFICE—G. B. Kaufmann, archt., Union Bank Bldg., 3 and 4 story, basement, sub-basement, Class A, steel, concrete, to J. V. McNeil Co., 5860 Avalon Blvd., for Times-Mirror Publishing Co., 100 North Bway. $500,000. Noted Jan. 29.

Ind., Indianapolis—MAUSOLEUM—Washington Park Cemetery, rein-con., stone, to Fifer Constr. Co., Greencastle. Est. $250,000.

N. H., Manchester — PUBLISHING — Union-Leader Publishing Co., 48 Hanover St., 3 story, 100 x 100 ft., brick, stone, rein.-con., plain found., to Davison & Swanberg, 37 Amherst St., est. exceeds $150,000; heating, to G. F. Hickey, 55 Linden St., electrical work, to A. L. Franks & Co., 1196 Elm St., est. $25,000. Noted Feb. 5.

New Brunswick—STATION—W. U. Appleton, Moncton, gen. mgr. (Atlantic Region) Canadian R.R. Co., C. S. Gzowski, ch. engr., system, Montreal, foundation work for station, to B. Mooney & Sons Ltd., St. John, on unit price basis. Noted Jan. 8.

Que., Montreal—STATION—Canadian Pacific Ry., J. W. Orrock, Windsor St., engr. of buildings, general contract Breslay Station, Jean-Talon St., to Anglin-Norcross Ltd., 892 Sherbrooke St. W.; electric wiring, to Canadian Comstock Co., 620 Cathcart St.; roof and sheet metal, to Eastern Steel Products, De Lorimer St., acoustical treatment, to Alexander Murray & Co., 4035 Richelieu St., hardware, to James Walker Hardware, 412 St. James St. Est. $525,000.

Industrial Buildings

FACTORIES AND MILLS

PROPOSED WORK

Ark., Ft. Smith—DRY ICE PLANT—Quix-Kold Corp., C. C. Beasley, pres., 408 Oklahoma Savings Bank Bldg., Oklahoma City, Okla., sketches by J. B. Klein Iron & Fdry. Co., 1004 West 2nd St., Oklahoma City, Okla., 17 ft. from floor to ceiling 51 x 100 ft., stucco, concrete, steel, rein.-con. $45,000 incl. machinery.

Ind., Gary — DAIRY PLANT — R. C. Cenek sketches 2 story, basement, 45 x 60 ft., rein.-con., brick, 17 West 23rd St. $42,000. Private plans.

Ia., Davenport—FACTORY—Davenport Candy Co., 211 East 2nd St., sketches by H. S. Muesse, 925 Amer. Bank Bldg., 1 story, 60 x 200 ft., concrete, brick, fireproof, Boise Ave. $40,000.

Md., Baltimore — PLANT — Amer. Cooperage Co., 118-150 North Kresson St., 2 story, 50 x 80 ft. plant addition.

Md., Fairfield (sta. Baltimore)—PLANT—Duraflex Co., Inc., 11 East Pleasant St., 1 story plant addition, incl. additional machinery.

Mass., Barnstable—GAS PLANT—Cape Cod Gas Co., P. P. Crafts, secy., 1 State St., Boston, illuminating gas plant, adjoining New York, New Haven & Hartford R.R. Yards. To exceed $40,000. Engineer not selected.

N. J., Asbury Park — MEAT STORAGE PLANT—Swift & Co., Sewall Ave., will not build 2 story addition. $40,000. Project abandoned. Noted Apr. 17.

N. J., Elizabeth—CHEMICAL PLANT—Allied Tar & Chemical Corp., D. W. Blaine, pres. and genl. mgr., South Bayway, rebuilding brick, steel, Richmond St. $40,000. Architect not selected. Noted June 5.

N. J., Jersey City — CHEMICAL PLANT — Mallinckrodt Chemical Wks., West Side Ave., 2 story, basement, brick, steel, 75 x 155 ft., brick, steel, West Side Ave. $40,000 or more. Project in abeyance. H. W. Andrews, 15 East 40th St., New York, engr. and archt. Noted Dec. 4.

N. J., New Brunswick — BAKERY — Owner, c/o H. G. Bach, archt., 63 Schureman St.,

Factories and Mills (Continued)

sketches 2 story, basement, brick, steel, Livingston Ave., $40,000.

N. J., North Bergen—FACTORY—Cinderella Slipper Co., 5700 Hudson Blvd., revised sketches rebuilding 3 story, basement, brick, steel, Hudson Blvd. $75,000. Noted Dec. 18.

N. J., Paterson—MILL—Lockwood, Greene Engineers, Inc., archts., soon let contract 100 East 42nd St., New York, 1 story, basement, brick, steel addition, plain found., for Canova & Simone Silk Co., 182 Cedar St., $40,000.

N. J., Plainfield—TOOL FACTORY—Walker Turner Co., 66 York St., Jersey City, altering tool manufacturing plant, South Ave. and Beekman St. $40,000.

N. Y., Ridgewood (sta. Brooklyn)—BAKERY—Classen Sons, 2365 Silvers St., bakery, Hughes St. $50,000.

Okla., Oklahoma City—ICE PLANT—E. A. Liebman, 1214 West 18th St., sketches 100 ton raw water ice plant, Klein and Reno Sts. $100,000. Private plans.

Tex., Beaumont — BAKERY PLANT — Fair Maid Baking Co., International Great Northern R.R. tracks and Mittman St., San Antonio, and Houston, 2 story, brick, rein.-con., plain found. $50,000.

Tex.,● Longview — LAUNDRY — H. Glover, Longview, brick laundry. $60,000.

Vt., Bellows Falls—MANUFACTURING, etc.—Vermont Newspaper Co., W. C. Belnal, Atkinson St., plans by H. H. Owens, 3 North State St., Concord, N. H., 2 story, brick manufacturing and office building. $40,000 or more.

Utah, Ogden — WOOLEN MILL — Intermountain Worsted Co., Ogden, 90 x 600 ft. plant and 90 x 600 ft. warehouse, both 1 story. O. Clawson, Manli, dir.

BIDS ASKED

Ill., Bloomington—See "Contracts Awarded."

N. J., East Rutherford — FACTORY — East Rutherford Syringe Co., 75 Mozart St., East Rutherford, bids about Apr. 15, general contract 2 story, basement, brick, steel, plain found., 54 Mozart St. $40,000. J. T. Camlet, 26 Piaget Ave., Clifton, archt. Noted Feb. 12.

N. J., Elizabeth—FACTORY—Fordham Shirt Co., Fulton St., taking new bids general contract altering and constructing 2 story, basement, 35 x 100 ft. brick, steel addition, 5th and Fulton Sts. $40,000. L. Quien, Jr., 229 Broad St., archt. Former bids rejected. Noted Feb. 19.

CONTRACTS AWARDED

Calif., Olive—PRE-COOLING PLANT—Olive Heights Citrus Assn., 2 story, basement, rein.-con., to York Ice Mchy. Co., 5051 Santa Fe Ave., Los Angeles, $74,500.

Ill., Chicago—RABBIT PACKING PLANT—Raisin Brook Packing Co., Dundee, Mich., and 6242 South Western Ave., Chicago, awarded contract design and construction to Chicago Industrial Constr. Co., 53 West Jackson Blvd., rabbit packing plant on 40 acre site, incl. office, glass enclosed display room, Rabbit Brook Inn, gas station, cages, Cicero Ave. and Lincoln Hy. Est. incl. land $250,000.

Ill., National City—RENDERING PLANT—East St. Louis Rendering Co., 3 story, 40 x 75 ft., rein.-con. plant, incl. 10 x 36 ft. platform, to J. I. Gedney, 1416 Hall St., East St. Louis, $44,360. Noted Jan. 8.

Ind., Indianapolis — FACTORY — Eagle Machine Tool Co., 24 North Noble St., brick, steel, 24 North Noble St., to W. E. Van Landingham, 309 Lemcke Bldg. Est. $41,000.

N. Y., Brooklyn — ICE PLANT — Supreme Coal & Ice Co., 551 Nostrand Ave., general contract ice plant, to Oforu, Inc., St. Marks Ave. Est. $75,000. Noted Jan. 8.

N. J., Carlstadt — ICE MANUFACTURING PLANT — Carlstadt Consumers Ice Co., 501 11th St., general contract remodeling 1 story, basement, brick, steel, to Frick & Co., Waynesboro, Pa. Est. $40,000. Noted Feb. 5.

O., Canton—FACTORY—Union Metal Mfg. Co., 1432 Walnut Ave. S. E. 1 story, 60 x 340 ft., corrugated steel, Maple Ave. N. E., to Hiner Structural Steel Co., 332 2nd St. N. W., $40,000.

Okla., Norman — ICE PLANT — Quix-Kold Corp., C. C. Beasley, pres., 408 Oklahoma Savings Bank Bldg., Oklahoma City, 17 ft. from floor to ceiling, 51 x 100 ft., stucco, concrete, steel, to J. Kennedy, Norman; pumps, to Worthington Pump & Machine Co., Elmwood, Cincinnati, O. Est. $45,000 incl. machinery. Noted Oct. 30.

Tenn., Kingsport—RAYON YARN MILLS—Tennessee Eastman Corp., c/o Eastman Kodak Co., Rochester, N. Y., rayon yarn mill, to Ridge Constr. Co., 355 Lewiston Ave., Rochester, N. Y. Est. $1,000,000. Noted Jan. 22.

GARAGES

PROPOSED WORK

Ill., Bloomington—Sampson Oil Co., Durley Bldg., W. Brubaker, pres., sketches 3 story, 120 x 140 ft., 400 car storage garage, Main St. $100,000. Architect not selected.

Ind., Ft. Wayne—F. Gaskins, c/o Pohlmeyer & Pohlmeyer, archts., 260 Central Bldg., 5 story, 60 x 150 ft., rein.-con., brick, steel garage, 124 West Washington St. $150,000.

N. J., Union City—Owner, c/o J. G. Helmers, archt., 147 Summit Ave., sketches 2 story, basement, brick, steel garage, 14th St. $150,000.

N. Y., Flushing—Polk Realty Corp., 26 Court St., Brooklyn, sketches by J. Millman, 26 Court St., Brooklyn, 100 x 198 ft. service garage, 39th Ave. and 170th St. $65,000.

N. Y., Jamaica—Branhill Realty Co., 163-18 Jamaica Ave., plans by M. Klein, 65 Court St., Brooklyn, 114 x 136 ft. service garage, Archer Ave. and Standard Pl. $50,000. **Maturity late in fall.** Noted Feb. 12.

N. Y., Richmond Hill (sta. Staten Island)—Mymand Constr. Co., 6730 75th St., Middle Village, sketches by M. Perlstein, 6735 75th St., Middle Village, service garage, Gould Ave. and Addison St. $40,000.

N. Y., Tottenville (br. Staten Island)—Dpt. Water Supply, Gas & Electricity, Municipal Bldg., New York, bids about Mar. 10, general contract repair company service building, Joline Ave. $85,000. F. Wall, 576 Oakland Ave., West New Brighton, archt.

N. Y., Woodside—Mymand Constr. Co., 6730 75th St., Middle Village, sketches by M. Perlstein, 6735 75th St., Middle Village, 100 x 125 ft. service garage, 54th St. and 39th Ave. $40,00.

B. C., Steveston—Easthope Bros. Ltd., West Georgia St., Vancouver, sales and service station.

BIDS ASKED

N. Y., Flushing—See "Contracts Awarded."

N. Y., Jamaica — Hyman's New York and Jamaica Express, 143-01 101st Ave., taking bids general contract service garage and repair shop, 165th St. and Jamaica Ave. $40,000. E. Guterman, 164 Montague St., Brooklyn, archt. Noted Feb. 12.

N. Y., New York—See "Contracts Awarded."

CONTRACTS AWARDED

Mass., Cambridge—Jenny Mfg. Co., 8 India St., Boston, 1 story, concrete service and filling station, to W. H. Porter, 133 Spruce St., Watertown. Noted Feb. 5.

N. Y., Flushing—W. A. Walsh & Co., Bank of Manhattan Bldg., Long Island City, 100 x 120 ft. garage and auto laundry, Dahlia Ave. and Main St., day labor. $70,000. A. Eccles, 29-28 Hunter Ave., Long Island City, archt. **Maturity after July 1.** Noted Jan. 29.

N. Y., New York—Berk-Lafayette Realty Co., L. Berkowitz, pres., 320 Bway., 2 story, 80 x 145 ft. service garage, separate contracts. $75,000. **Maturity Apr. 1.** D. S. Lang, 1860 Bway., archt. Noted Jan. 29.

Pa., Glassport — Standard Oil Company of Pennsylvania, W. E. Black, in charge, Peoples Gas Bldg., Pittsburgh, 1 story, 32 x 112 ft., brick, tile, 8 car garage and office, 1 story, 14 x 26 ft. metal pump house, 1 story, 40 x 80 ft., brick warehouse, 2 horizontal lubricating oil tanks, 50 ft. wood barrel flat steel platform, moving 2 steel tanks some distance to new foundations at site, to Weissert Bros., 2415 Latrobe Ave., McKeesport. Noted Jan. 29, under "Factories and Mills."

SHOPS AND FOUNDRIES

PROPOSED WORK

Md., Baltimore—MACHINE SHOP—Crown Cork & Seal Co., Eastern Ave. and Kresson St., plans by L. R. White, Jr., Court Square Bldg., 1 story, brick, steel, 7,000 sq.ft. floor space, Eastern Ave. and Kresson St.

N. Y., Flushing—REPAIR SHOP—A. Beandel, Brookville and Conduit Blvds., 2 story, 50 x 100 ft. repair shop, Brookville and Conduit Blvds. $40,000. Private plans.

POWER PLANTS

PROPOSED WORK

Colo., Grand Junction — Redlands Co., subsidiary Cities Service Oil Co., G. and E. B. Bldg., new hydro plant, incl. enlarging distribution canal, improvements at Gunnison River Dam. $250,000. R. B. Dessert, Grand Junction, pres.

Conn., Bristol—PLANT—Connecticut Light & Power Co., Riverside Ave., plans by H. A. Hayden, 175 Main St., brick, concrete, steel central heating steam plant for Federal Hill business section. To exceed $40,000.

Ind., Anderson — City power plant improvements, incl. rebuilding No. 4 boiler, switchboard, new materials. $50,000. H. Gwinnup, Anderson, engr.

Ind., Bloomington—Bd. Comrs. Monroe Co., A. Eller, aud., plans by A. Grindle, Bloomington, rein.-con., brick power house. $75,000.

Ind., Richmond—City improving light plant. $859,100.

Ia., Cedar Falls—Iowa State Teachers College, c/o State Bd. Educ., W. H. Gemmill, secy., State House, Des Moines, bids in spring 54 x 135 ft. rein.-con. brick heating plant. E. E. Cole, Cedar Falls, archt.

Ia., Grundy Center — City, c/o E. V. McBroom, clk., postponed indefinitely, brick, concrete light and power plant.

La., New Orleans—New Orleans Pub. Serv., Inc., 317 Baronne St., improvements during 1931, incl. new mains $90,000, new services $30,000, meters $90,000, extending horsepower system to serve industrial consumers $30,000, renewing, replacing inadequate mains and services $100,000, automative equipment $17,000, tools $5,000, standardization of services $18,000, metering and pressure regulators at gas plant $17,000, metering and regulating station at Independence St. $15,300, miscellaneous $10,000, mains and meters and services destroyed $2,000.

Me., West Pownal—State School for Feeble Minded, V. E. Vosburgh, 1 story, brick power house and laundry additions, school grounds. $45,000. Architect not selected.

Mass., Boston—Edison Electric Illuminating Co., 39 Boylston St., plans by Bigelow, Wadsworth, Hubbard & Smith, 11 Beacon St., and soon takes bids 1 story, brick, steel, rein.-con. steam heating plant, concrete found., Kneeland St. corner Utica St. $750,000. Whitney Engr. Co., 250 Stuart St., engrs. Noted Jan. 1.

Mass., Gardner — Commonwealth of Massacusetts, Dpt. Mental Diseases, State House, Boston, new heating plant at hospital. $150,000.

Mass., Holyoke—Holyoke Water Power Co., 1 Canal St., applied for license for constructing power station extension, on bank of Connecticut River. $40,000 or more. Private plans.

Minn., Duluth — Bd. Educ., surveys power plant at Central High School. $100,000. A. J. Ward, board engr. C. Foster, 412 Sellwood Bldg., consult. engr.

N. Y., Watertown—Beebe Island Corp., c/o Phelps & Hudson, Watertown, 10,000 hp. water power development. $800,000. J. G. White Eng. Corp., 43 Exchange Pl., New York, engr.

O., Lima—City, municipal power plant.

B. C., Vancouver—Northwestern Power Co., 200 Electric Ry. Chambers, Winnipeg, Man., 1 story, basement, 36 x 90 ft., brick electrical substation. $300,000. **Maturity in May.**

BIDS ASKED

Ind., Noblesville—See "Contracts Awarded."

Mich., Detroit — Mar. 24, by Bd. Water Comrs., 735 Randolph St., power plant structures. G. H. Fenkel, genl. mgr. and ch. engr.; adv. E. N.-R. Feb. 26.

CONTRACTS AWARDED

Ill., Chicago—Commonwealth Edison Co., 72 West Adams St., masonry contract 1 story, 74 x 97 ft. substation, 352-60 Wendell St., to Herlihy-Mid Continent Constr. Co., 20 North Wacker Dr., $75,000.

Ind., Noblesville — Indiana Electric Corp., power plant improvements and additions, own forces. $75,000. J. T. Kester, Noblesville, engr.

Kan., Goodland—Public Utilities Consolidated Corp., L. E. Lynch, mgr., 1 story, 27 x 40 ft., concrete, brick power plant addition, to G. P. Reintjes, 2517 Jefferson St., Kansas City, Mo. Est. $70,000.

Kan., Kansas City—Bd. Pub. Utilities, C. A. Lowder, secy., general contract 1 and 2 story, basement, 94 x 130 ft., rein.-con., steel power plant, on site Old Quinpaw Water Plant, to Wyatt & Barcus, 1609 Nebraska St., Kansas City, Mo., $196,615; 13,000 volt re-actors and signal system between two plants, to General Electric Co., Dwight Bldg., Kansas City, Mo., $6,676; four 5-phase 13,000 volt lightning arresters, 24 S.P.S.T. 400 amp. 15,000 volt outdoor disconnected and 10-circuit 2,500 volt switch structure, to Westinghouse Electric & Mfg. Co., 2124 Wyandotte St., Kansas City Mo., $2,172. Grand total $178,463. Noted Feb. 5.

WAREHOUSES

PROPOSED WORK

Idaho, Pocatello — Jennings-Cornwall Warehouse Co., 353 West 2nd St., Salt Lake City, Utah, sketches remodeling motor bus building into storage warehouse. $50,000.

Mass., Framingham — Commonwealth of Massachusetts, Armory Comrs., State House, Boston, 1 story storehouse at State Armory. $45,000. Private plans.

N. J., Newark—New Jersey Bell Telephone Co., 540 Broad St., 6 story, basement, brick, steel warehouse, garage, Fabyian Pl. and Loretta Ave. $250,000. Project in abeyance. Noted Dec. 4.

N. Y., New York—Star Co., 220 South St., will award contract after Mar. 1, 3 story warehouse and industrial building, 419 Water St. $95,000. Lockwood, Greene & Co., 100 East 42nd St., engrs. Noted Jan. 22.

N. Y., West New Brighton (mail Staten Island) — J. A. Lynch, pres. Richmond Boro, St. George, soon takes bids general contract storage and service (truck). $60,000. F. Wall, 576 Oakland Ave., archt.

BIDS ASKED

California — Mar. 11, by State Hy. Comn., Sacramento, grading, also bituminous treated crushed gravel or stone surfacing shoulders on 29.8 mi. Grape Vine Station-Bakersfield Rd., Kern Co.—0.9 mi. grading, concrete surfacing Galivan Overhead Crossing, Orange Co.—6.9 mi. Holtville-East High Line Canal Rd., Imperial Co. C. H. Purcell, hy. engr.

N. Y., Auburn—Mar. 31, by Dpt. Correction, State Office Bldg., Albany, storehouse for industries, foundry and shop buildings at Auburn Prison.

CONTRACTS AWARDED

Calif., San Francisco—Bradshaw Realty Co., 4 story, rein.-con. warehouse, Kearny and Francisco Sts., to Cahill Bros., 206 Sansome St., $150,000.

Ky., Lexington — American Suppliers, Inc., subsidiary American Tobacco Co., 111 5th Ave., New York, warehouse, to Carter Constr. Co., Greenville, N. C. Est. $500,000. Noted Jan. 22.

See proposal advertising on page 116